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CONTRIBUTION TOWARD A MONOGRAPH OF THE LABOULBENIACEAE

Part 1

by
Roland Thaxter

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[Boston,
American Academy of Arts and Sciences,
1896-1908]

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INTRODUCTORY NOTE.

In the fourth volume of the "Memoirs of the Boston Society of Natural History" (No. VI, April, 1888), the writer published an account of the American forms belonging to the family of Entomophthoreæ, with notes on all the species then known, which was intended to form the first of a series designed to include all the American fungi parasitic on insects. The subject was suggested to me by Professor Farlow, while I was a student in his laboratory, as one promising data of sufficient interest to furnish material for a doctor's thesis. The Entomophthoreæ, however, having proved adequate in themselves to fulfil this requirement, the remaining entomogenous forms were laid aside in the hope that, at some future time, the original plan of a complete monograph might be carried out. In the paper just mentioned, a brief summary was given of all the fungi characterized by this peculiar parasitism; and, in addition to the family of Entomophthoreæ, several groups were in a general way distinguished. Of these one comprises the entophytic and probably commensalist Schizomycetes (?) represented by the genus Enterobrus and its allies, to which might be added certain lower forms of the same order supposed to give rise to contagious diseases among insects; a second includes the perfect and imperfect or "isarial" conditions of the entomogenous species of the genus Cordyceps and its allies; while a third embraces all the members of the then small and little known family of Laboulbeniaceæ. To these should be added a few miscellaneous forms parasitic on insects; and perhaps, also, such fungi as are found in nature only on the remains or excreta of certain insects. The last, however, since they are saprophytic, cannot be called entomogenous in the more strict sense of the term.

Since the completion of the monograph above mentioned, I have accumulated material of entomogenous fungi whenever the opportunity has offered, but have found the number of forms so unexpectedly large that, as in the former instance, it has become necessary to abandon my plan of completing a monograph of all the remaining groups in a single paper. In view of this fact, the Laboulbeniaceæ have been selected as the subject of the present memoir, since they include by far the greater portion of the material referred to.

At the time when my attention was first attracted to the Laboulbeniaceæ by the discovery of several new species in the vicinity of New Haven, Connecticut, during the summer of 1890, it included six described genera (two of which have proved to be synonyms), represented by fifteen described species of which one only was from North America; while, of the remaining forms, two were from South America and the rest from Europe. To these, however, European writers have since added a single species, while my own observations have served very considerably to increase the total number of forms referable to this family. A greater portion of these additions have already been described in a series of papers which have appeared from time to time during the past few years in the "Proceedings" of the Academy, and serve as a systematic basis for the present monograph, in which will be found enumerated more than one hundred and fifty species from various parts of the world, distributed among twenty-eight genera. The labor and time involved in obtaining and studying the several thousand specimens which have been examined in the preparation of this paper and of the accompanying plates, can hardly be appreciated by any one who has not had personal experience of the many difficulties associated with the manipulation and study of these, for the most part, very minute plants. It is, therefore, needless to say that my investigations, carried on as they have been in connection with other occupations, are incomplete and unsatisfactory in many points relating to the structure and development of certain genera, for the proper study of which sufficient time or material, or both, have not been available; and although a certain amount has been done in connection with the nuclear changes which take place in the sexual organs before and after fertilization, I have been unable, as yet, to reach conclusions concerning them sufficiently definite to warrant their publication. The results obtained, however, although in very many respects imperfect, have served to demonstrate the unlooked-for numerical importance of the group, its great diversity, and, above all, have afforded definite information concerning the course of development of its members, as a result of which their pivotal position among the higher fungi is clearly indicated.

Of the species enumerated, more than half have been collected in New England by myself and studied while still living, the remainder having been derived from the examination of dead insects in the collections to which I have had access, or from insects sent in alcohol by numerous correspondents to whose kindness I owe very many interesting forms. For such favors I am under special obligations to Miss A. M. Parker, who has sent me many specimens of Carabidæ from Washington; to Prof. O. F. Cook, who has placed at my disposal all the Coleoptera collected by him in Liberia; to Mr. Theodore Pergande for many interesting specimens collected in or near the District of Columbia; to Prof. Alfred Giard for the communication of several important specimens as well as references to literature; while the Rev. J. L. Zabriskie, Mr. M. A. Barber, Dr. H. M. Richards, Mr. J. M. Aldrich, Mr. William Beutenmueller, Prof. S. A. Forbes and Dr. G. von Istvanffi have also greatly assisted me by the communication of numerous specimens. I am also indebted to the kindness of Miss Helen Bondy, of Vienna, for a large number of house-flies collected in that city, from which were derived the important series of specimens of *Stigmatomyces Baeri* illustrated on Plate I. Special acknowledgment is, moreover, due to Mr. Samuel Henshaw, to whom I am indebted for the determination of the host insects, as well as for the privilege of free access to the collections under his charge, including the type collection of the late Dr. Leconte.

In making these acknowledgments, I may add that it is my intention to continue my studies of insect fungi as my opportunities permit; and that the communication of further material from correspondents, especially of Laboulbeniaceæ, will be greatly appreciated. I may also add the hope that, the family being placed with the publication of the present monograph on a moderately intelligible basis, from a systematic standpoint; it may not, like the other groups of entomogenous fungi, be reduced to a condition of chaos through the indiscriminate publication of new forms based largely on the character of the host or on its habitat; since, as we shall presently see, these are but uncertain guides in recognizing the species.

Cryptogamic Laboratory of Harvard University,
Cambridge, June, 1896.

MONOGRAPH OF THE LABOULBENIACEÆ.

Presented May 8, 1895.

PART I.

In the first part of this Memoir I have given an account of the History, Distribution, General Morphology and Development, Hosts, etc., of the Laboulbeniaceæ; while the second part comprises a systematic examination of the species and genera illustrating the family. Before entering, however, on the detailed consideration of the topics mentioned, it has seemed desirable, by way of introduction, to present a brief account of the more general characters of these plants.

Unlike the majority of fungi which subsist as parasites of living insects, the present group includes none of the conspicuous productions that are so characteristic among entomogenous fungi generally; and their usually minute size doubtless accounts, in some degree, for the fact that, although they are in certain respects among the most important of fungus organisms, they have been so long neglected by botanists and so generally overlooked or disregarded by entomologists. When examined *in situ* on the host insect, they appear in general like minute, usually dark-colored or yellowish bristles or bushy hairs, projecting from its chitinous integument either singly or in pairs, more commonly scattered, but often densely crowded over certain areas on which they form a furry coating. Unlike other entomogenous fungi also, the Laboulbeniaceæ can lay no claim to economic importance; and although they may be said to produce a contagious cutaneous disease, they give rise to none of the fatal epidemics which are liable to be associated with the parasitism of species of Cordyceps and Entomophthora. On the contrary, the very existence of these parasites would seem to be dependent on the fact that the host is not destroyed by their attack; since their own life ends with that of the insect to which they are attached, and their perpetuation from generation to generation and from year to year is undoubtedly dependent on the direct transference from one living insect to another of their reproductive bodies. So far, then, as they are at present known, they inflict little if any appreciable injury on the host, and even when the latter is completely covered by them it shows no more marked signs of injury than is indicated by a greater restlessness, owing perhaps to a slight irritation which they may be supposed to produce. This absence of appreciable injury, associated as it is with true parasitism, is due to the fact that the habit of growth of the plants in question is an external one, unassociated, except in rare instances, with any penetration of well-developed haustoria into the body cavity, the parasite in almost all cases deriving its nourishment through at most a slight perforation of the host's integument. The hosts affected are all comparatively long-lived hibernating insects, and more or less continuous feeders; and in the present, as in so many other instances, are obliged to become the unwilling medium for the nutrition of an often numerous and varied population from which they are freed only by death.

An external parasitism, like that of the plants in question, on hosts living and as a rule actively locomotive, whether in water, in the air, or on the ground, would naturally be associated with a comparatively simple structure adapted to the exigencies of such a life; and a glance at the accompanying plates will show that such a simple type form may be traced in a general way throughout the group. A main body, or receptacle, is fixed by means of a blackened base, or foot, to the integument of the host, and consists in most cases of a very small number of cells differently arranged in different genera. This receptacle gives rise above to certain peculiar appendages of very variable form, commonly connected with the production of the male sexual organs; while from the same individual, with few exceptions in which the plants are diœcious, female organs are also variously produced from which perithecia are eventually developed. In the perithecia, which may arise singly or in considerable numbers from a given individual, and which are quite remarkable in structure, are produced the reproductive bodies or ascospores that are formed in asci identical in all respects with the organs thus named in other members of the great group of ascomycetous fungi. The ascospores thus formed germinate on the surface of the host to which they become attached by a blackened modification of their basal extremity, and, without the formation of any hyphæ, grow directly to new individuals by means of successive cell divisions. In respect to size the mature individuals vary considerably within certain rather narrow limits, for while the smallest species measure somewhat less than one-tenth of a millimeter in total length, a very few exceed a millimeter from base to tip, while by far the greater number do not attain more than half this length. Within the limits of size and fundamental structure just described, the opportunities for eccentricity of form seem, however, to have been abundantly utilized, and the modifications which they present are so singular that the members of the group may well rank among the most remarkable of vegetable productions.

It is not to their variety and eccentricity of form, however, that they owe their special claim to interest and importance among plants in general and fungi in particular; but to the fact that, associated with their comparatively simple vegetative development, they present sexual phenomena the complicated nature of which would indicate that they occupy a position among the highest members of their class. It is hardly necessary to remark that any fresh evidence in this connection has a special interest at the present time; since, as a result of the views so strenuously maintained by Professor Brefeld and his school, the existence of sexuality of any type among the higher fungi, has become, to say the least, discredited by a majority of the mycologists of the present day. If we are to admit nevertheless, as seems quite unavoidable, that the Laboulbeniaceæ are fungi, and also, as seems equally unavoidable, that they are ascomycetous fungi in the strict sense of the term, it must also be admitted that they demonstrate the sexual origin of the ascus beyond any reasonable doubt. However views may differ as to the true phyllogeny of the group as a whole, the most devout disciple of the so-called "school" of De Bary could hardly have devised a series of forms better adapted than the present family to confirm his general conclusions. Despite this fact, one looks, as a rule, in vain for even a reference to the Laboulbeniaceæ in the host of text-books which have made their appearance within the past few years, while in the works of Professor Brefeld, so far as I have been able to ascertain, they are not even mentioned by name.

Further discussion of these matters may well be deferred, however, until the morphology of the more important genera has been considered, and with this brief note and general affirmation of my own views in regard to the vexed question of sexuality among the ascomycetes, we may turn at once to consider the family in detail.

Historical. In reviewing the literature relating to the Laboulbeniaceæ it will be noted that, although the list of titles is not a short one, a considerable number have reference either to brief notes or to articles which deal at second hand with previously published data, while the original contributions are comparatively few. A complete list of references, so far as I have been able to obtain them, will be found appended; but in briefly tracing the history of the family in so far as its literature is concerned, I shall omit reference to such articles as are not in the nature of contributions to a knowledge of the group.

This knowledge may be said to have originated with the publication by Robin of his classic "Histoire Naturelle des Végétaux Parasites," in which, for the first time, the vegetable nature of these organisms was recognized. In this work two species are enumerated, for the reception of which the new genus *Laboulbenia* Montagne et C. Robin (e familia Pyrenomycetum novum genus) was erected; the generic name being selected in honor of the entomologist Laboulbène, who was, perhaps, the first to observe the *L. Rougetii* of these authors, which occurs on species of *Brachinus* in Europe. The second form, *L. Guerinii*, was obtained from a South American species of the aquatic genus *Gyretes*, and both are figured and described at considerable length. Although the spores are described, no mention is made of their origin; while the perithecia are spoken of as sporangia. It is, therefore, somewhat uncertain what this author's views really were in regard to the position and relation of the forms described, although the comment "Genus sphæriaceum, maxime singulare, entomogenum, quoad perithecium Capnodio analogum" would lead one to suppose that it was thought to be ascigerous.

Robin's materials were received in part, however, from the entomologist Rouget, to whom belongs the credit of the first published note on these parasites, which, as early as 1850, three years before the publication of Robin, he had described and figured in the "Annales de la Société Entomologique de France," under the title "Note sur une production parasite observé sur le *Brachinus crepitans*." He did not, however, recognize the true character of the organisms described, nor did he distinguish several different species which he must have had before him, if one may judge from the diversity of the hosts on which he states that he had observed this "production parasite." It may be mentioned also that in 1852 still another species of Laboulbenia was observed by Mayr, the *L. Nebriæ* described many years after by Peyritsch, and was supposed by him to be a pathological condition of the insects chitinous integument.

During the next sixteen years little of importance was published concerning the group; but it is of interest to note that Prof. H. A. Hagen, in his well-known monograph of the Termites, mentions that he had observed on the larva of a worker of *Termes bellicosus* a Laboulbenia closely resembling the *L. Guerinii* of Robin, concerning which a further note will be found in connection with the subsequently described *L. Hageni*. In 1857 also, Kolenati, in a paper entitled "Epizoa der Nycteribien," described certain parasites on these wingless flies, which infest various species of bats, placing them among the worms in a new genus to which he gave the name *Arthrorhynchus*, including two supposed species, *A. Diesingii* and *A. Westrumbii*. Two years later (1859) Diesing, in his "Revision der Rhyngoden," made these two forms the types of a new tribe of Vermes, the *Arthrorhyngodeæ*, characterized by a quite astonishing zoölogical anatomy. The same genus, it may be mentioned, was subsequently rechristened *Helminthophana* by Peyritsch, who placed it in its proper kingdom and family, its connection with the Laboulbeniaceæ having been previously pointed out by Brauer (1871).

In 1868 an important addition to the family was made by Knoch (1868), who described as *Laboulbenia Bæri* the interesting form, redescribed in the succeeding year by H. Karsten (1869) as *Stigmatomyces muscæ*, which occurs in middle and western Europe on the common house-fly. The paper of Karsten owes its importance to the fact that this writer was the first to recognize the presence of a highly developed type of sexuality in these plants, and although the account given is largely incorrect as to the details of morphology and development, the important fact of the existence of a trichogyne fertilized by antherozoids is distinctly emphasized and rightly compared to the similar conditions present in the Florideæ. The use by this writer of such terms as "archegonium" render it uncertain what his opinion as to the true position of the plant was at this time. In a later work (1895) the same writer includes all the Laboulbeniaceæ in a group of "Stigmatomycetes," placed between the Ustilagineæ and the Pyrenomycetes. The same form, it may be mentioned, was redescribed in 1872 by Sorokin as *Laboulbenia muscæ.*

With the exception of a note by Robin in his "Traité du Microscope," where he figures *Rhachomyces pilosellus* (Robin) Thaxter, no further contributions of importance are met with until the publication by Peyritsch of the first of his well-known papers on the family (1871), in which he describes and figures the "*Laboulbenia Bæri*" of Knoch already referred to, as well as the Arthrorhynchus of Kolenati, discarding the generic and specific names given by this writer, and designating the species as "*Laboulbenia Nycterybiæ.*" In this paper the existence of asci was somewhat doubtfully made out; but the sexual process described by Karsten was not observed. A new form, *Laboulbenia Nebriæ*, was also described and figured.

Two years later (1873) a second paper by the same author made its appearance, in which several new species and genera were described and figured, and a synopsis of the whole family appended. In this paper the author for the first time recognizes in a measure the grounds which have proved to be the determining factors in connection with generic distinctions in the group. The forms enumerated are twelve in number, distributed among five genera, one of which must now be regarded as a synonym. The general morphology and development is described, in so far as it was then understood; but not without many inaccuracies, the sexual processes being undetermined, except in so far as concerns the existence of a trichogyne, which was observed and figured in several instances. The developmental relations between the appendage perithecium and receptacle were accurately made out in connection with the two genera Laboulbenia and Stigmatomyces, and the origin of the asci as buds from some central cell was suggested. The asci were not, however, accurately observed. A third paper by Peyritsch, published in 1875, contains additional notes on the development and occurrence of the Laboulbeniaceæ, without, however, making any essential contribution to previously published data. In none of the papers of this writer are the characters of the male organs determined, and he seems to incline to the opinion that the latter are represented by the shorter branches of the appendages, which he regarded as pollinodia and supposed to conjugate with the trichogyne.

Following these publications of Peyritsch, we have in 1884 the suggestive summary by De Bary of the characters of the group so far as then known in the "Doubtful Ascomycetes" of his Morphology and Biology of the Fungi, etc. In 1886 occurs the note of Gerke, to which my attention was drawn through the kindness of Professor Giard, in which he gives a figure that, without doubt, is intended to represent the "*Appendicularia entomophila*" of Peck, published two years later. In the same year (1886), Karsten published in Hedwigia, under the title "Doubtful Ascomycetes," a reassertion of his former observations on the sexuality of Stigmatomyces, in reply to the publications of Peyritsch and De Bary already mentioned, denying their ascomycetous nature and giving what he supposed to be the method by which the spores were formed.

In 1889, Berlese again summarized the group, adding to the thirteen species then known a new form (*Laboulbenia armillaris*) found on an acarid from South America. With the exception of the writer's own notes on the family, but two papers published since the one just mentioned remain to be noticed: that of Giard (1892), in which he describes, as a new genus Thaxteria, a remarkable species of Laboulbenia from the Javan Mormolyce; and that of Istvanffi (1895), in which he redescribes as *Laboulbenia gigantea* a large form of *L. elongata,* giving his impressions of its morphology and development, stating his disbelief in the sexuality of the group, and expressing the erroneous opinion that the individuals are derived from a vegetative portion growing within the body cavity of the insect.

GENERAL MORPHOLOGY AND DEVELOPMENT.

Spores. The spores of the Laboulbeniaceæ present a uniformity of form and structure quite remarkable for so varied a group, being in all cases, without exception, hyaline and fusiform or acicular in shape; and although in the single genus

Amorphomyces they are continuous (Plate V, fig. 29), in all others they are divided into two cells by a septum or pseudoseptum. In the great majority of cases the two spore segments are of unequal size; that which is terminal in relation to the axis of growth being, as a rule, much the longest: although in a few cases, as in Zodiomyces and Ceratomyces (Plates XXIV to XXVI), the reverse is true; while in still other instances the septum may be more nearly median, as in Compsomyces (Plate XI, fig. 15). The spore contents usually consists of more or less homogeneous granular protoplasm, except in the genus Amorphomyces, the spores of which when living contain numerous, often large, oil globules. In all cases a large spherical nucleus may be, as a rule, readily demonstrated in either segment (Plate I, fig. 13). A gelatinous envelope, more or less well developed and characteristically thickened about its base, always surrounds the spore; serving as a protective covering for the latter as well as facilitating its adherence to the host insect when it comes in contact with its surface. In the majority of cases this envelope, though often adherent about the tip of the spore, is continuous around it; but in *Ceratomyces furcatus* and *C. contortus* (Plate XXV, figs. 4 and 10) the separation between the spore segments involves the envelope also, which is marked by a corresponding constriction.

The spores are produced in the asci in fours or eights (Plate XXIV, fig. 9, Plate XI, fig. 17), in the first instance usually disposed more or less definitely in pairs, one of which is slightly higher than the other; and the members of a given spore pair are discharged together through the pore of the perithecium, the ascus wall having been previously absorbed. The juxtaposition of two individuals at the point of contact with the host, a condition essential for the perpetuation of the diœcious species, is thus insured in a majority of cases (Plate III, fig. 5). The spores are formed in the ascus, and therefore lie in the cavity of the perithecium after the wall of the latter has been absorbed, with the basal half uppermost; and the base is therefore directed towards the substratum on which it is discharged. Having become attached to a proper host, the swollen portion about the base, by its peculiar form, assists the spore in assuming the position necessary for germination; the upper extremity, if at first adherent, soon freeing itself and projecting from the substratum at an acute angle. A conspicuous exception to the conditions just described is found in the genus Moschomyces, the minute spores of which are irregularly distichous in the eight-spored ascus, and become free in a mass within the distal portion of the perithecium, whence they are discharged, not in pairs but in small masses, each mass probably giving rise to the so-called individual, which may thus in reality be compound (Plate XI, figs. 16 and 18).

The transfer of the spores from one host to another is probably accomplished, as a rule, by the direct contact of two insects; as, for example, during coitus, perhaps never otherwise in the aquatic species, as might be inferred from the remarkable constancy with which some of these forms occur in definite positions on the elytra or elsewhere; but may doubtless be otherwise effected, at least in cases where more or less gregarious hosts inhabit or hide during the day in moderately moist situations. Under these conditions it is not improbable that spores discharged upon materials with which such insects have come in contact may subsequently adhere to other individuals on which they may develop. Although a gelatinous envelope is always a protection of extraordinary efficacy, it does not seem probable that the spores can retain their power of germination for any considerable time, at least in a dry condition.

Having reached a proper host, and having adhered to it by virtue of its generally viscous character, the spore begins to germinate at once.

Germination. The first indication of germination in the spore usually consists in the modification of its lower extremity into a blackened organ of attachment, the *foot;* the blackening resulting from a change which takes place in the gelatinous envelope in this region by which it becomes converted into a black, opaque, hardened, more or less elastic medium of attachment to the host. This conversion of the lower portion of the basal spore segment into an indurated organ by which the growing plant adheres firmly to the substratum on which it grows, is apparently unconnected with any effect resulting from contact with the chitin of the insect; since, in exceptional instances, where the usual discharge of spores has been prevented from any cause, the latter, while still within the perithecium, may begin to germinate and even attain an advanced development (Plate V, figs. 1 and 19). In such cases the first step in the process consists, as in normal germination, in the formation of a blackened foot of the usual type. A foot of this nature is not, however, invariably present. If the figures of Peyritsch are to be relied upon, there is no such blackening in the case of Helminthophana (Plate VIII, fig. 10), which is represented as penetrating the integument of the insect on which it grows by the intrusion of a papillate haustorium, there being no blackening whatever of the basal cell. The typical foot is also conspicuously absent in certain other genera. In Moschomyces also, to which reference has been made above, this organ is not differentiated; and the plant penetrates the soft integument by means of a cellular haustorium which, expanding within the body cavity of the host, holds the parasite firmly attached. The most striking exception, however, is presented by the genus Rhizomyces, in which the penetrating haustorium reaches a development quite beyond that of any other form. In this case (Plate

IV, figs. 1 and 3) the basal cell sends into the body cavity of the host a copiously branched and well-developed rhizoid-like organ, the interior of which is apparently continuous with that of the basal cell.

In cases where a typical foot is formed, it may constitute a cell distinct from the basal cell of the individual, as is at least often the case in *Stigmatomyces Bæri* (Plate I, fig. 14), a condition which may very likely exist in many other instances, although obscured by the blackening already mentioned. In some instances this blackening involves more than the basal cell of the mature plant, as in some species of Ceratomyces (Plate XXV, figs. 15 to 17).

In forms like those just mentioned in which a definite haustorium is present, it is quite evident that this organ constitutes the means by which the parasite absorbs from its host the nourishment necessary for its growth, and at the same time serves to fasten it securely. In the great majority of instances, however, it is probable that there is no intrusion of any kind from the ordinary form of blackened foot into the substance of the host. That this is the case may be clearly seen in preparations in which the parasite is shown attached to some transparent portion of the host's integument, as in fig. 4, Plate III. In the specimen here represented several individuals were fixed to the surface of the thin integument of one of the abdominal segments of the host, the substance of which was perfectly transparent, so that by inverting the piece to which they were attached, so as to view its lower surface, one could observe with accuracy the relation of the adherent portion of the foot to the chitinous surface to which it is applied. In such a specimen it is evident that this sucker-like adherent portion consists of a flat area in the closest contact with the chitin of the integument, and consisting of a thin membrane through which the absorption of nutriment takes place, bordered, as in the figure cited above, by the thick base of the indurated external wall of the foot proper. It should be mentioned, however, that Peyritsch figures sections of a fly's integument which indicate a slight penetration through the pore canals in the case of Stigmatomyces.

In addition to its function of attachment and absorption the foot may, in some of the aquatic genera more particularly, perform the office of a fulcrum on which the plant is supported and by means of which it is allowed a certain freedom of motion which it could not otherwise attain. This is effected through the more or less sudden and distinct enlargement of the foot above its point of attachment. The rounded fulcrum thus produced rests on the surface of the host, allowing the body of the plant, although appressed, to lie free from the insect and to roll upon it from one side to the other, as far as the elasticity of the attached portion will permit. This is most clearly seen in Chitonomyces (Plate XXVI) or Hydrœomyces, both of which genera inhabit hosts that live, for the most part, submerged, and which are rapid swimmers. Under these conditions of life the advantages of such a contrivance, to allow a certain freedom of motion, are sufficiently apparent. The same office of a fulcrum for the support of the perithecium is effected in some species of Ceratomyces by the conversion of a considerable portion of the receptacle into a foot-like organ (Plate XXIV, fig. 1).

After having become attached to the insect, and during, or sometimes before, the formation of a definite foot, the spore elongates more or less distinctly and becomes further divided by the formation of tranverse septa into a series of superposed cells, varying in number in the different species and genera, from the further development of which result the three fundamental parts of which these plants are usually composed: namely, a main body, the *receptacle;* one or more spore-producing portions, the *perithecia;* and lastly, one or more *appendages* which, in the majority of cases, are associated with the formation of the male sexual organs.

The Receptacle. The term "receptacle" has been used to designate that portion of the fungus on which the appendages, together with the perithecia or their stalk-cells, are inserted; but it is necessarily used with some looseness, and is sometimes unavoidably applied to series of cells which are neither homologous in origin nor similarly related to the other essential organs of the plant. In the genus Laboulbenia, for example, the whole body of the individual, exclusive of the appendages and perithecium, is spoken of as the receptacle; although, in this instance, it consists fundamentally of the usual two superposed basal cells, while distally it is formed from a consolidation of the stalk-cell of the perithecium (cell VI), which has become laterally united with what is in reality the base of an appendage (cells III–V). In other cases it is often difficult to determine exactly how the receptacle should be limited, as, for example, in the genus Chætomyces (Plate XI, fig. 20), in which it consists of a single series of superposed cells which give rise directly to perithecia or to appendages.

The simplest type of receptacle, which is found in more than half of the genera, consists of only two superposed cells, the upper of which bears the appendage, at first terminally; while the perithecium, or perithecia, if there are several, are lateral productions from the same cell. This type is well illustrated by such genera as Haplomyces and its allies (Plate VII) Compsomyces (Plate XI, fig. 7) and similar instances; while, as has been above indicated, even genera like Laboulbenia are fundamentally similar. In other genera various degrees of complication are found in the development of the receptacle which passes gradually from the simple two-celled type to such highly developed forms as are present in Zodiomyces (Plate XXIII) in which it attains its maximum development as compared with other known genera of the group. Other multicellular forms may be illustrated by such genera as Chætomyces or Enarthromyces (Plate XI, fig. 20 and IV, fig. 8), in which it consists of a single row of superposed cells, and Rhachomyces (Plate XII), in which, from a similar simple axis a series of appendiculate cells is cut off on one side, the predominance of transverse divisions resulting in an elongate form. As an illustration of the reverse condition where a predominance of longitudinal divisions is present, genera like Dichomyces or Diplomyces may be mentioned, in which the habit is stout and compact, this type reaching its greatest complication in the genus Zodiomyces just referred to.

Although the number and arrangement of the cells which form the receptacle in a given genus is often very constant, this is by no means invariably the case; and, even in the same species, fixity in this respect does not always exist. In Peyritschiella, for example (Plate VI), although the individuals of a given species do not vary greatly, in so far as the number and arrangement of the cells is concerned, no two species are alike in this respect. The same is true to a more marked degree in Rhachomyces (Plate XII), a genus which is further remarkable from the fact that the main body of the receptacle is in the nature of a lateral proliferation from the sub-basal cell of what may be termed the primary receptacle, as well as from the fact that this proliferation may be once or several times repeated, as will be presently noted. Again, in Ceratomyces there may be wide variations in this respect, not only between different species, but in individuals of the same species; while in other instances in this genus the number and arrangement of the cells of a given species may be invariable.

In the simple as well as in the more complicated forms, the receptacle is more or less flattened, usually in an antero-posterior plane, the side bearing the appendage in the mature individual being considered for convenience "posterior," where this distinction is possible. In some instances, however, the flattening is in a plane at right angles to that just mentioned, as in Dichomyces and Diplomyces. In a majority of instances this flattening is well marked; but it is most pronounced in forms which have a distinctly appressed habit of growth in relation to their substratum.

Appendages. With but a single exception in the whole group of Laboulbeniaceæ, the receptacle gives rise to one or more appendages which, though not invariably, are, as a rule, clearly distinguished from it, as well as from the perithecium. These appendages, though extremely variable, and affording, in many cases, excellent specific distinctions, are chiefly important from the fact that they are, with few exceptions, associated with the production of the antheridia or male sexual organs of the plant. In all cases the primary appendage is originally a terminal structure, developed at least in part, often entirely, from the terminal spore segment, which is as a rule distinctly smaller than the basal, and never under any circumstances concerned in producing any portion of the true receptacle. While this terminal character of the primary appendage is often obscured, as in Zodiomyces, Rhachomyces and other genera, it is in many cases sufficiently evident; for example in such instances as Stigmatomyces (Plate I, figs. 2–13), Cantharomyces (Plate VII), and the like. In the genus Rhachomyces the primary appendage is represented by the single small bristle at the very base of the whole series of appendages, which are thus nearly all secondary and quite different in origin from the originally terminal primary one. Again, in Zodiomyces the originally terminal primary appendage is soon sloughed off, its place being taken by a multitude of secondary ones, also quite different in origin.

Although they are very important from a systematic point of view, it would be quite superfluous in the present connection to enter into any detailed description of the many variations of form and structure which the appendages, both primary and secondary, exhibit; and further details should be sought in the special descriptions of the genera. It is sufficient for the present purpose to say that the appendages, using the term to include both primary and secondary, may be solitary or very numerous: greatly elongated or consisting merely of single short cells; simple or branched in a great variety of ways, either sympodially or monopodially, or more or less irregularly; hyaline or deeply colored; stiff and bristle-like or flexuous and slender; in short, as may be seen by a glance at the accompanying plates, showing wide variations as to
c minor details even in nearly related forms.
um The sterile appendages, or the sterile portions if such are present of fertile appen-
it iss, which are always more or less filamentous and composed of successive cells
for ex end to end, may become very highly developed, forming a dense tuft which is
of a sin ch more conspicuous than the main body of the plant itself. The function of
appendag ly developed sterile branches is doubtless primarily that of protection for the
The st ichogyne, which is subsequently developed, and they may, perhaps, have a
consists of ce in facilitating the fertilization of this organ by holding around it a drop
terminally; wh is usually found at times condensed on the surface of the hosts, the
ductions from the sa apt to hide by day, at least, in cool moist situations. It might
myces and its allies (Pl hese sterile portions of the appendages extend, in many cases,
while, as has been above of the perithecium, that they were of some assistance in
similar. In other genera va es; but it is a curious fact that the latter, despite their
ment of the receptacle which nly in exceptional cases found adherent to any portion

of them; and it seems certain that they do not thus act as brushes for the more convenient transfer of these bodies. In general the ultimate filamentous sterile branches, or branchlets, consist of a single series of superposed cells which appears to elongate, at least in so far as I have been able to determine, through the successive division of the terminal cell.

One curious structure, the significance of which is as yet undetermined, should be mentioned before leaving the sterile portions of the appendages. This structure consists of a spine-like process laterally developed from the primary appendage, and has been observed in only a few instances. It is most pronounced in an apparently undescribed genus parasitic on *Tachinus pallipes,* which has not yet been found in a mature condition. It also occurs in *Sphaleromyces Lathrobii* (Plate XI, fig. 19) and in *Rhadinomyces cristatus* (Plate IX, fig. 22), in both of which it seems to disappear at an early period. The process which is persistent at the summit of the antheridium in Haplomyces may also be of a similar nature.

Male Sexual Organs. As has been previously mentioned, the essential function of the appendage, apart from the secondary function of protection which it undoubtedly subserves in many cases, is as a rule connected with the production of the male sexual organs; although in the following genera, Amorphomyces, Dimorphomyces, Dimeromyces, Enarthromyces, Peyritschiella, and Dichomyces (probably also in Chitonomyces and Hydræomyces), the latter are wholly independent structures unconnected with the sterile appendages which usually accompany them.

A comparison of the character of these male organs in the different genera makes it apparent that they afford the best, indeed the only basis for the natural separation and grouping of the members of the family as a whole, which are thus distinguished into two main categories: one including those forms having male organs from which the male elements are produced exogenously; the other including those forms in which the male element arises endogenously. Of these groups the first may be further subdivided, on a similar basis, into forms in which the male organs are borne on specialized male individuals, and those in which the sexes occur together on the same individual. Again, as will be seen presently, these monœcious and diœcious groups are further distinguished according as the male organs are simple or compound; while their relative position, distribution, etc., afford opportunities for minor subdivisions.

Since they are undoubtedly homologous with similar structures in the Florideæ, the male organs and male elements in the Laboulbeniaceæ may be properly designated as *antheridia* and *antherozoids,* respectively; the former, as will be seen, consisting of a single "antheridial cell," or a group of such cells, the latter of a single naked or thin-walled cell.

If we separate the genera of Laboulbeniaceæ, on the basis above outlined, into forms with endogenous and those with exogenous antherozoids, it will be found that it is only in two aquatic genera that the forms included in the first-mentioned category occur: Zodiomyces and Ceratomyces being the only instances in which this type has been definitely observed. In general the antheridial branches are not highly differentiated even in the more typical instances; while were the demonstration of the existence of male elements of this type dependent on the data afforded by the less well-marked examples, one might be inclined to doubt the presence of any sexuality in such cases, despite the presence of a well-developed trichogyne. In Zodiomyces, however, the antherozoids are produced in the form of buds which arise from the tips of short special branches (Plate XXIII, figs. 21–23) which assume a rod-like form and eventually fall from their attachment. These bodies have a definite wall and seem to be sought by the tip of the trichogyne in a fashion to which reference will be made below. A second well-marked instance is found in *Ceratomyces rostratus*, from the antheridial branches of which are developed rods of definite form and size, which become separated and adhere to the trichogyne. In this instance the rods are formed successively from a definite point at the distal end of the fertile cells of the antheridial branch (Plate XXIV, figs. 23–24), each rod usually becoming detached from its point of origin before its successor has begun to form. In other species of the genus, however, these bodies are not so clearly differentiated, and seem to be replaced by slender, often long, filaments which eventually break up into rods that are presumably functional as antherozoids. The adherence of the antherozoids to the mother-cell, or to one another, as in the last two instances mentioned, may be assumed to render fertilization more certain; since it is evident that were such bodies separated, as soon as they were mature, from a plant growing, as in the present instance, on an isolated and rapidly swimming host, the chances of their ever coming in contact with and adhering to the trichogyne would be reduced to a minimum. In view of the fact that this separation does not seem to take place at once, and that the long slender trichogyne must, from its position, inevitably be continually brought into contact with them while still *in situ*, through the motion of the plant which would necessarily result from the activities of its host, it seems quite probable that such antherozoids, in order to be functional, must become detached at the moment when they come in contact with and adhere to the trichogyne.

In all other genera of the family the antheridia are more complicated in structure, consisting of highly specialized cells, or groups of cells, within which the antherozoids are formed endogenously and from which they are discharged through a special orifice in the form of free, naked, or nearly naked protoplasmic masses. Among such antheridia two distinct classes may be clearly distinguished, which I have termed *simple* and *compound*, respectively: although instances occur in which antheridia of the "simple" type are so closely associated that they may be regarded as transitional forms between the two types. In the first class, the simple form is characterized by the fact that the antheridial cell is quite independent of any similar cells, however closely they may be united to it, and discharges its antherozoids into the surrounding medium through its proper mouth. In the second instance, on the other hand, several such cells, closely associated to form a specialized organ, discharge their antherozoids into a common cavity from which the latter make their escape into the surrounding medium through a single aperture.

The *simple antheridium* (Plate II, fig. 15) is usually a more or less flask-shaped cell, which may be solitary or associated with similar cells grouped together with or without regularity. Although in Amorphomyces, a genus wholly destitute of appendages, it results from the direct modification of the terminal portion of the germinating spore (Plate V, figs. 20 and 23), it originates in other genera as a terminal or lateral outgrowth from the appendage or its branches. In a majority of genera, if it does not terminate the appendage or one of its branches or branchlets, the antheridium is itself a branchlet, as, for example, when it is sessile; but in a few instances this terminal character is lost and the organ is formed as a definitely intercalary cell, as in Rhadinomyces. In the compound type, these cells seem always to be intercalary in origin, although material has not been available for the study of their development.

The form of the simple antheridium is remarkably constant, the single cell of which it is composed being distinguished, more or less abruptly, into a basal, somewhat inflated portion or venter; and a terminal, more slender, usually sub-cylindrical portion, the neck, originally developed as a terminal outgrowth, which, at maturity, becomes perforate at its apex for the discharge of the male elements. The cavity of the venter is separated from that of the neck by a kind of diaphragm, abruptly distinguished on the venter side, and much less so on the neck side. This diaphragm, which seems to be formed by the deposition of a ring of cellulose in the position indicated, is perforate in the middle so as to allow the contents of the venter to pass out into the neck through an opening which is much smaller than the diameter of the cavity of the neck itself (Plate I, fig. 26). The cavity of the neck therefore, which may be conveniently called the canal, though of about the same diameter throughout the greater portion of its length, is more or less abruptly narrowed just before passing into the venter. The contents of the venter during its active period, as it increases in volume, pushes through the narrow opening in the diaphragm into the cavity of the neck, and the portions thus extruded, when they have reached a certain definite size, become separated from the mass whence they were derived; and, assuming the form of short cylindrical rods, the antherozoids pass into the general cavity of the neck, the diameter of which is but slightly larger than their own, and thence make their final exit through the terminal pore. This process of abjunction, by which small but uniform pieces become separated from the contents of the venter as it is pushed into the neck, continues for a period which varies somewhat in different cases, but may begin some time before the female organs are mature, and continue long after they have been fertilized. Although one sees many cases in which the neck contains a continuous series of antherozoids which are evidently pushing one another out through the terminal opening, these bodies seem to be able to make their exit quite independently of one another, although at the same time they also appear to lack any indication of a power of independent motion, amœboid or other.

As has been already mentioned, the form of the simple antheridium is subject to inconsiderable variations which depend in general on the relative development of the neck or of the venter, the latter being sometimes short and stout and abruptly distinguished, while in other cases it may run gradually into the neck without any such clearly marked differentiation. The neck, too, may be short and rather stout, or long and slender, straight or curved, the extremes in these respects being illustrated by such instances as the following: *Laboulbenia decipiens* (Plate XX, fig. 20), *L. Elongata* (Plate II, fig. 15), Teratomyces (Plate X, figs. 6 and 11), Compsomyces (Plate XI, fig. 14), or *Stigmatomyces Baeri* (Plate I, fig. 26).

The disposition of the antheridia, and their relation to one another on the same appendage or branch, is a matter of much importance in affording generic distinctions, and even, in a few cases, is of service in defining species. On this basis all the genera having simple antheridia, with the exception of Amorphomyces, which has invariably a single antheridium, might be separated into two categories: those in which the antheridial cells are disposed in definite series on the appendage, and those in which they are more or less indefinitely placed.

In the first category are found forms in which the series is a single one, as in Stigmatomyces (Plates I, figs. 8–12; VIII, fig. 3), the antheridial cells succeeding one another in a single vertical row, while a somewhat more complicated condition exists in Idiomyces, where three vertical rows are present (Plate IX, figs. 18–19). Again, in Helminthophana there are four rows symmetrically arranged (Plate VIII, fig. 10) on the single appendage. In all these cases the antheridial cells are themselves branchlets from the axis of the appendage. In Rhadinomyces and Corethromyces, however, the entire axis of the antheridial branch is formed from the superposed venters of the antheridial cells, the necks alone being free and projecting in a vertical row (Plate IX, figs. 5, 9, and 14).

In Teratomyces a somewhat similar condition is brought about through the repeated sympodial branching of the appendage, the false branchlets (Plate X, figs. 6 and 11) being either antheridia or short sterile outgrowths, terminated by a characteristic beak-like cell. Although, in this last instance, a regular series of antheridial cells, either alone or mingled with sterile branchlets, is produced, the type is not strictly comparable with that of the previously mentioned instances; in which the antheridial cells or branchlets originate as a result of the septation of an axis already formed and the production of monopodial branchlets from the resultant cells. In Teratomyces it is evident that the serial arrangement is necessitated by the relative position of the crowded appendages.

In the second category may be included all the remaining genera, comprising forms in all of which the simple antheridia are not thus disposed in regular series, but are more or less irregularly placed on the appendages. Although never serially arranged through monopodial branching, individual examples occur, however, in which the grouping of the antheridia is very characteristic and specifically distinctive. Among the instances included in this general category, Laboulbenia is by far the best illustration, since it comprises a greater variety of forms than any other genus. Among those in which there is no definite relation in position between the antheridia, *Laboulbenia elongata* or *L. Pterostichi* may be mentioned, while among forms in which there is a more definite grouping, *Laboulbenia variabilis* (Plate XXI, fig. 3) or *L. proliferans* (Plate XVII, fig. 23) offer the best examples of more or less regular and distinctly characteristic clusters. Species in which the antheridia are borne in pairs, or are irregularly grouped, are common; while in one instance, the curious *L. zanzibarina* (Plate XVII, fig. 3), a single short series may result, as in Teratomyces, from continued sympodial branching.

In regard to the number of simple antheridia that may occur in individual cases, it may be mentioned that there are often wide differences, not only between different species, but between individuals of the same species. *Laboulbenia texana*, for instance (Plate XX, figs. 16–18), has one, rarely two, antheridia, while *L. elongata* may have from five to fifty or more. Wherever fertilization has failed, as not infrequently happens, the production of antheridia is greatly increased (Plate II, fig. 8). Further reference to this circumstance will be made in connection with the "abnormal forms" described below.

Turning to the *compound type of antheridium* we find much less uniformity than in the simple type just described, although the antheridial cells which make up the essential portion of this organ are practically identical with the simple antheridium. As has been already mentioned, these cells seem to be intercalary in origin as far as can be determined in the absence of a knowledge of their early development, and instead of being wholly or partly free, both the necks and venters are closely united below, beside or around a common cavity into which they discharge. Of the twenty-seven genera thus far described, about one-third are characterized by possessing this compound type of antheridium, and since that occurring in Dimeromyces is one of the largest and most easily studied, it may be taken as an illustration. In this genus the species are diœcious, and the male individual reaches a maximum differentiation, being as well developed as the female, and bearing more than one antheridium (Plate IV, fig. 16), which possesses a stalk-cell and four basal cells lying below the antheridial cells. The antheridial cells in this case are six in number, symmetrically arranged in two rows, their venters large and emptying through long narrow canals into the somewhat inflated base of the long and slender "secondary" neck which serves as a common medium for the final discharge of the products of all the antheridial cells. The latter here correspond closely to those previously described in connection with the simple antheridia, and the formation from them of antherozoids is also similar in all respects. The canal, however, does not enlarge, as in the simple form, immediately after leaving the venter; but continues about the same diameter till it has nearly reached the general cavity at the base of the secondary neck, when it expands slightly. As a result, the antherozoids remain in connection with the protoplasm of the venter till they project some little distance into the cavity of the secondary neck, eventually separating from it and falling free into this general receptacle, whence, as represented in the figure, they may be seen at various points making their way out. The antheridium of Dimorphomyces is essentially identical with that just described, the male individual in this genus, however, producing but a single antheridium (Plate V, figs. 8–9 and 14–15). In Peyritschiella (Plate II, fig. 12), Dichomyces and Enarthromyces (Plate III, fig. 19), although the antheridium is somewhat different in form, the secondary neck being less prominent and less abruptly distinguished, its general structure is also essentially the same; the four to six antheridial cells in the last mentioned genus lying somewhat obliquely side by side in two rows, below a common cavity into which they empty. In these instances the antheridium has no stalk-cell, and is closely united to the receptacle. In Camptomyces and Eucantharomyces it terminates the appendage and is somewhat different in character. In Camptomyces the antheridial cells are placed around and beside a general cavity, and are arranged in several nearly vertical rows, emptying upwards through short necks into this cavity, whence they escape through the terminal pore of a short secondary neck (Plate VI, figs. 5 and 6). In Eucantharomyces the antheridial cells are also arranged in nearly vertical rows, and are more numerous than in the last mentioned genus. They empty into a general cavity, which is central and terminal, and are discharged through a well-developed, though somewhat irregular, secondary neck (Plate VII, fig. 27). In both these genera the material has been so limited in amount, and the antheridia are so difficult to observe by focussing through the asymmetrical arrangement of their numerous antheridial cells, that I have been unable to obtain a figure that would show satisfactorily the exact details of structure and arrangement presented by the latter. The gross structure is, however, made out without difficulty, and the general cavity is usually filled with very numerous antherozoids, which here and there may be seen in process of formation from the antheridial cells in a fashion exactly resembling that which occurs in the instances previously described.

A single type of compound antheridium remains to be mentioned, which occurs in Haplomyces and in Cantharomyces, and in this instance also, owing to the lack of sufficient material and to the complicated structure of the organ, much remains to be learned concerning its exact structure. The type is distinguished from those already mentioned from the fact that the secondary neck opens, as far as can be ascertained from the material available, through a lateral pore, and consists of a central cavity almost completely surrounded by the very numerous antheridial cells which open into it. This general structure may be made out by focussing through the organ; but no further details have been visible in the specimens examined. The antheridium (Plate VII, figs. 3, 9, and 22) is identical in the two genera mentioned, except that in Haplomyces it is terminated by a thorn-like cell, while in Cantharomyces it is placed below a well-developed sterile branching portion. With the exception of *Cantharomyces pusillus*, which may possibly prove to represent a new generic type, none of the species of these genera have been seen in a fresh condition, and they are the only ones possessing compound antheridia in which the discharge of the antherozoids has not been observed. The antheridium in these forms is the most highly developed that has thus far been noticed, and further observations upon it are greatly to be desired.

The antheridia are usually so placed that the antherozoids are discharged very near to, or even directly upon, the female organ when the latter is mature (Plate I, fig. 15; Plate II, fig. 2; Plate III, fig. 18). When they are associated with long and well-developed appendages, they are usually borne near the base of the latter (Plate II, fig. 5, anth.), and where also, as in the case of Laboulbenia, there are inner and outer appendages or branches, the male organs usually occur on the inner ones, that is, on those nearest to the female. There are, however, some exceptions to this rule in which the antheridia and trichogynes are not thus closely associated; as, for example, in Teratomyces, in which the former are borne some distance below the latter, and are curved away from them. In many cases also, though the two sexes may be closely associated, there is often a marked tendency in the male to turn away from rather than towards the female, as in Stigmatomyces and Eucantharomyces. In the diœcious genera, the male and female individuals are always in close proximity, their invariable association resulting from the fact that the spores always become attached to the host in pairs, corresponding to those which are formed in the ascus, and that, of any given spore pair, one member produces a male while the other produces a female (Plate V, figs. 2, 5, 17, 20, and 23). Notwithstanding the fact that the male and female organs are in general so closely associated, it is more than probable that cross-fertilization occurs quite as frequently, if not more frequently, than close fertilization; since not only are the species as a rule more or less gregarious in habit, but the maturition of the antherozoids invariably precedes that of the trichogyne, and the former continue to be produced long after the latter has been fertilized, in many cases after the perithecium has matured and begun to discharge its spores. This is true of forms having but a single perithecium; but more strikingly so in those which produce several successive perithecia. In Dimorphomyces, for example, the antheridium of the male individual continues to produce antherozoids indefinitely, while the female may produce two or even four sets of perithecia. The same extension of the functional period of the male is also seen in all the genera having compound antheridia. In forms having simple antheridia the same extension of functional activity in the male is often effected by the production of new antheridial cells or new fertile branches after the fertilization of the trichogyne.

As has been previously mentioned, the antherozoids are formed, in those genera which produce them exogenously, as lateral branchlets, the whole or portions of which become separated in the form of long slender rods (Plate XXIV, figs. 21, 24; Plate XXIII, figs. 21–23), having a definite cell wall, while in the genera producing them endogenously the contents of the venter of the antheridial cell are protruded through the opening in the diaphragm into the cavity of the neck, and this protruded portion, having reached a definite size, becomes separated as a free mass of protoplasm, which, having been, as a rule, moulded to a cylindrical form in the cavity of the neck, makes its exit through the terminal pore. When free, the endogenous antherozoids exactly resemble bacilli or cocci in appearance, becoming rounded at the ends so that the short forms are almost spherical (Plate I, fig. 26; Plate VI, fig. 5; Plate II, fig. 2; Plate III, fig. 19). Their substance is refractive and homogeneous, and I have been unable, by staining, to differentiate a definite nucleus. Although, when first separated from the contents of the venter, they are undoubtedly naked protoplasmic masses, in some cases at least a thin wall seems to be secreted around them after their exit from the antheridial cell. In Enarthromyces, for example, which possesses antherozoids larger than those of any other known form, such a wall appears to be present, and the same may very probably be the case in other forms in which the antherozoids are so minute that exact observations in this respect are made with difficulty, even after they have become attached to the trichogyne. When freshly discharged they are usually sufficiently characteristic in appearance to be readily distinguished from the bacteria and yeasts which are often so numerous on certain individuals as to completely corticate the appendages.

The discharge of the antherozoids from the antheridial cell is a slow process, and probably does not occur more frequently than once every two or three hours; at least this is about the rate observed in individuals which have been separated from the host and placed in water. It may be, however, that the rate is more rapid under natural conditions; since the parasite does not survive very long after separation from the host, which doubtless disturbs not only its nutrition, but also its general turgescence. From the secondary neck of compound antheridia the discharge is, of course, often much more rapid at times, and a dozen or more antherozoids may be seen to make their exit within a few minutes after an individual of Camptomyces, for example, has been mounted in water. Cultures of the antherozoids in water, continued for many days, have never shown any indication of an attempt at development. Reference has already been made to the duration of the active period of the antheridia, and it remains to note the fact that the numbers of antherozoids formed during this period from a single antheridium must be counted by hundreds, or even thousands, in the case of the more highly-developed compound forms.

Female Sexual Organs. — It has been previously mentioned that in a majority of forms the antheridial appendage is developed from the terminal cell of the germinating spore. The female organs, however, are always formed from the products of division of the basal cell, never in any case from the terminal cell, where this is present. Although the products of the division of the terminal cell are invariably sterile or male, it is not true, as might be supposed, that the basal cell or its derivatives have any inherent female character; since, in many cases, both normal and abnormal antheridia and antheridial branches may arise below the point of insertion of the female organ, or even, in exceptional cases, replace it entirely (Plate II, figs. 7–8). While, then, the primary appendage is, as a rule, terminal, the trichogyne, as well as the perithecium which follows it, are always lateral, with the single exception of Amorphomyces, where both are developed terminally from the unsegmented spore. This lateral origin is, however, very often obscured in the fully developed plant, from the fact that the perithecium, as it develops, is apt to push the appendage more or less to one side, and assume an apparently terminal position; as, for example, in the genus Stigmatomyces or in Laboulbenia.

We have already seen that the basal cell of the germinating spore begins its development by the formation of a cross partition which divides it into an upper and a lower cell, and that the base of the latter becomes modified to form the foot. The development of the upper, although varying considerably in the different genera, may, perhaps, be best illustrated by reference to the series of figures (Plate I, figs. 1–24) of Stigmatomyces, which is typical of the more simple forms. In this series, fig. 2 represents the spore after it has become attached to the host, the foot is beginning to form and the upper half is considerably enlarged. Figs. 3–5 illustrate the further development of the upper cell, the lower still remaining as at first. In fig. 6, the lower cell has become divided into two superposed cells, the upper of which (*b*) forms the basal cell of the appendage. The lower cell (*y*) then divides in two by a transverse partition, forming the basal cell and the sub-basal cell (*a*). This sequence of divisions is not apparently constant, and in other forms, at least, it more frequently happens that the partition which separates (*a*) from the basal cell is formed before that which separates (*a*) from (*b*). In fig. 7, the nucleus of cell (*a*) has already divided, although no wall has formed between the daughter nuclei. In fig. 8, this wall has been formed and the cell (*a*) has become divided into an upper and a lower cell (a' and a''), cell (*b*) remaining permanently without further division as the base of the appendage. Of these two cells (a' and a''), the lower remains without further change as the terminal cell of the receptacle; while the upper (a') alone continues to develop into the female sexual organ and the perithecium. It will be noticed that even at as early a stage as is represented in fig. 8, the antheridial cells have begun to mature and to discharge their antherozoids. Cell (a') next begins to grow upward and outward (fig. 9), and by the formation of a septum is soon divided (fig. 10) into an upper and a lower cell (*d* and *c*). From the upper of these cells, which may be called the *primordial cell of the procarpe,* is formed the whole of the female sexual organ, while from the lower (*c*), which may be similarly called the *primordial cell of the perithecium,* are developed the cells which form the perithecium proper. This lower cell (*c*) is the first to show further signs of development, and becomes divided by a more or less obliquely longitudinal septum (fig. 11) into two cells (*c″* and *c′*). The cell (*c″*) then begins to grow upward, and becomes divided into an upper and a lower portion, fig. 12 (*z*) and (*p*). The lower cell (fig. 12, *p*) constitutes the "stalk-cell," while the upper continues to divide, as will be presently described. The cell (*c′*) of fig. 11, on the other hand, becomes separated into two upper cells (fig. 12, *i*, *i*), lying on opposite sides so that only one is shown in the figure, and a lower cell (*h*), which may be called the secondary stalk-cell. The cell (*z*) and the cells (*i*, *i*) then continue to grow up around the base of the cell (*d*), the primordial cell of the procarpe. One of the cells (*i*, *i*) then becomes separated into a single lower and two upper cells, while the other becomes separated into a single lower (figs. 13, *o*) and a single upper cell (*n*), as also does the cell (*z*); the cells (*o′*) and (*n*) of fig. 13, resulting from its divisions. There are thus formed three proper basal cells of the perithecium, two anterior (*o*, *o*) and one posterior (*o′*), but two of which are shown in the optical section (fig. 13), and from them four cells are separated above which continue to grow upward and surround the cell (*d*), the base of which is now (fig. 13) completely enclosed and has become separated by a cross partition as the cell (*f*) from the part (*e*) which still remains free above it.

We then have this basal part (fig. 13) constituting a central cell (*f*), distinguished from the free part above (*e*) by a cross partition, and completely surrounded by the seven cells (*o*, *o′* and *n*, *n*), but four of which are, of course, shown in the optical section. The central cell (*f*) then remains without further development until fertilization has taken place; the terminal portion of cell (*e*) in the mean time becomes separated from the part below (fig. 14, *e″*) as a usually very small cell (*e′*), which immediately begins to produce a terminal outgrowth, the young trichogyne. This small cell is more marked in the genus illustrated than in most others in which it is not, as a rule, so clearly distinguished; the filamentous portion usually growing directly from the apex of cell (*e*), from which it is separated by a septum (Plate II, fig. 2). Cell (*e′*) and the projection (*tr*) from it must therefore be considered as constituting together the trichogyne proper. As the latter develops, the cell (*e′*) becomes less well marked, while the filamentous portion reaches a development that varies in different specimens, but is usually not greater than is represented in fig. 15 (*t r*) and in fig. 16. Before fertilization it can be clearly seen, as in the last-mentioned figure, that the trichogyne and the basal cell (*a′*) constitute a single cell, and the nucleus is usually readily made out in the position indicated at the base of the trichogyne. Meantime the cells (*n n*) and (*o o′*) of fig. 13 have increased in size, and the former have begun to grow up still further around the base of cell (*e*), fig. 13, (*e″*), fig. 14.

With the maturity of the trichogyne the female organ has completed its development, and we have the condition represented in fig. 15, from which it will be seen that the latter, which may be conveniently termed the *procarpe*, consists of three distinct parts, which, so far as is known, are present in all genera of Laboulbeniaceæ. Of these the uppermost may be properly called the *trichogyne*, and in the present illustration is unicellular, though often, as will be seen presently, far more complicated in structure; the middle portion in this, as in all other instances, also unicellular, which we may call the *trichophoric cell* (*e″*), and the lowest portion (*f*), which may be termed the *carpogenic cell*, being that portion of the procarpe which is fertilized, and the only part which persists and undergoes further development. As is shown in the figure, the carpogenic cell is completely surrounded by eight cells, four of which (*o o*) lie below and around it, and, remaining undivided, form the basal cells of the mature perithecium; while the four others (*n n*) completely surrounded it, and, as will be seen later, form by further division the wall- and lip-cells of the perithecium. These eight cells are arranged in four longitudinal rows, and, in the stage represented, the upper four have already begun to grow up around the trichophoric cell, the lower half of which is now enclosed by their advancing tips. In the stage represented in fig. 15, the antherozoids, which have been continuously escaping from the antheridia since the stage represented in fig. 7 was reached, begin to adhere to the trichogyne, often in larger numbers than are represented in the figure, and fertilization is accomplished, probably with considerable rapidity if one may judge from the rarity of conditions which are intermediate between that represented in fig. 15 and that shown in fig. 19, where the trichogyne has entirely disappeared. In the comparatively infrequent instances in which one finds an adherent trichogyne belonging to a procarpe in which fertilization has evidently been accomplished, slight elevations may be seen which coincide with the position of usually more than one of the antherozoids (figs. 17 and 18). In such cases, although it is very difficult to determine the actual presence of conjugation in the case used for illustration, it is evident that a wall has been formed around the antherozoid, which often seems inflated and nearly empty of contents.

In brief, then, we find the female organ developed at first as a lateral outgrowth from one of the cells of the receptacle. From this outgrowth a terminal and a subterminal cell are cut off. From the former of these by further division is produced the procarpe, consisting of a terminal receptive portion, the trichogyne, a middle connecting portion, the trichophoric cell, and a lower essential portion, the carpogenic cell, which alone develops further; while from the latter arises by further division the whole of the perithecium proper. The subterminal cell thus forms the basal and wall-cells of the perithecium, while the terminal one, although at first quite free, forms its contents.

The further development of the young perithecium after the fertilization of the trichogyne may be also best illustrated by reference to the same series of figures of Stigmatomyces (Plate I, figs. 17–24). In fig. 17, which represents a condition in which fertilization has been completed, the procarpe remains unchanged, except that the carpogenic cell (*f*) has become somewhat enlarged and elongated. In fig. 18, the first indications of development are seen in the carpogenic cell, which, through the formation of two transverse partitions, has become divided into three superposed cells, while the trichogyne has begun to wither. As a rule, however, it has entirely disappeared when the first divisions of the carpogenic cell are visible. In fig. 19, this division of the carpogenic cell has become still more pronounced, and nothing remains of the trichogyne but its insertion. Disregarding the accompanying development of the wall-cells of the perithecium, and following only the divisions of the carpogenic cell, we may distinguish the three cells into which it first divides as follows: the lower of the three (*i s*) may be termed the *inferior supporting cell*, while the upper constitutes the *superior supporting cell* (*s s*). The remaining cell, which lies between the two, may be conveniently termed the *ascogonium* (*a m*), and is the only one of the three which undergoes any further development; the two supporting cells eventually disappearing entirely. Up to this point the development of the procarpe is similar in all the genera, so far as they are known; but the further divisions of the ascogonium show certain variations in different genera and even, apparently, in different specimens of the same species, although it is improbable that individual variations of this nature are at all common. In the present instance the ascogonium divides into a lower and an upper portion, the latter at the same time dividing, by somewhat irregularly longitudinal septa, into four cells. The lower portion (figs. 20–23, *i s t*) remains unchanged, being eventually destroyed, like the two supporting cells (*s s* and *i s*), and may be called the *secondary supporting cell*. We have then the ascogonium dividing simultaneously into five cells, one of them, the secondary supporting cell, remaining sterile, while the others constitute the *ascogenic cells*, and at once begin to bud upward; the buds (fig. 21, *as*) developing into asci (fig. 22, *as*), and in this, as in a majority of cases, arising in a more or less distinctly double row. (See Plate I, fig. 38; Plate III, fig. 1; Plate V, fig. 18.)

In Stigmatomyces the four ascogenic cells, but two of which appear in the figures, are at first symmetrical neither in form, size, nor arrangement; but, as the asci begin to develop, become so placed that one is anterior, one posterior, and one lateral on either side. In fig. 23, which represents an antero-posterior view, the two lateral ascogenic cells are shown, placed more or less symmetrically with reference to one another, the anterior and posterior ascogenic cells (not shown in the optical section) occupying a similar relative position in front of and behind them.

Returning now to the perithecium proper, which we left in the condition represented in fig. 15, it will be remembered that it originated as a single cell (fig. 10, *c*), which has divided several times, and that the upper products of these divisions have grown up around the base of cell (*d*), from which, as we have seen, the female organ is developed. In this stage (fig. 15), it will be seen to consist of the stalk-cell (*p*), the secondary stalk-cell (*h*), and three basal cells (*o*), but two of which are visible in the figure, and four primary wall-cells (*n*, *n*), which surround the carpogonium (*f*) and the base of the trichophoric cell (*e''*). At a stage slightly earlier than that represented in fig. 15 a further development from the three basal cells takes place, which is not indicated in the optical section. This development consists in the upgrowth from the basal cells (*o*) of four cells corresponding to the wall-cells, but alternating with them and lying partly between them and the carpogonium. As they continue to grow upward and to increase in size, they separate the wall-cells completely from the structures developed from the carpogenic cell, growing up around the latter in a fashion exactly resembling that of the wall-cells. There are thus developed from the three basal cells, eight cells arranged in two series; an outer, the primary wall-cells, four in number; and an inner, also consisting of four cells. The further growth and the successive divisions of the cells of these two series, although its course is identical, is, nevertheless, quite independent in either case; the divisions of the cells of the inner series occurring in general after those of the outer series have taken place. The further development consists simply in a continued upward growth around the products of the division of the female organ, accompanied by the separation of a terminal portion. The latter is then again separated into two portions, the upper of which divides again, and so on, until the number of cells characteristic of the genus or species has been formed. This process may be made somewhat clearer by reference to figs.

17–20. In fig. 17, the primary wall-cells (fig. 15, n, n) have undergone their first division, having each separated into an upper and a lower cell (w and n'). The four cells of the inner series (n'') have also been developed from the three basal cells (o, o); but, although they extend upward above the septum which has divided the wall-cells, they are not themselves as yet septate. In fig. 18, the wall-cells remain as before, but each of the cells of the inner series has divided into two, ($p\,c$) the parietal cells and ($n\,c$) the primary canal-cells. In fig. 20 the primary canal-cells have again divided into two ($n\,c'$ and $n\,c''$), and this division has been preceded by a corresponding separation of the upper wall-cells (w, w) into the two cells ($w\,x$ and $w\,x'$). This condition continues until the asci have reached a considerable development (fig. 23); but before any of them are mature a last division takes place, by which the cell ($n\,c''$) of the same figure is separated into the cells ($c\,c$) and ($t\,c$) of fig. 24, and the cells ($w\,x'$) are separated into ($w\,y$) and ($w\,z$). In Stigmatomyces, then, there are present in the mature perithecium, before the spore discharge has commenced, an outer series of *wall-cells* disposed in four longitudinal rows of four cells each, the terminal cells of which may be conveniently called the *lip-cells*, and also an inner series of cells alternating with the outer, and also arranged in four longitudinal rows, each made up of four cells, the lower of which may be conveniently termed the *parietal cells*, the three others being distinguished as the *canal-cells*. There are thus four parietal cells, twelve canal-cells and sixteen wall-cells, making a total of thirty-two cells in the perithecium proper, exclusive of the three basal cells, the stalk-cell and the secondary stalk-cell previously alluded to (o, h, and p of fig. 15).

The asci, in the mean time, have continued to bud from the ascogenic cells, so that their total bulk has greatly increased, and as a result the ascus mass begins to exert a considerable pressure in all directions on the surrounding cells. In this way the superior supporting cell, the secondary inferior supporting cell, and the parietal cells are gradually destroyed, and in most instances, though not usually in that which has been used as an illustration, the inferior supporting cell is eventually obliterated by pressure. In Stigmatomyces the lower series of neck-cells (fig. 24, $n\,c'$) become gradually inflated towards their distal ends and their walls are somewhat thickened, so that they act as guard-cells which control, to some extent, the passage of the spores from the general cavity of the perithecium to that of the neck. The asci as they mature are sloughed off from the ascogenic cells, and rapidly disappear, their walls being absorbed as soon as the spores are completely formed, so that the latter lie free in the cavity of the perithecium. The spore mass thus formed, being constantly augmented, pushes between the guard-cells ($n\,c'$) just mentioned, and being forced still further upward, destroys the two remaining series of canal-cells (*c c* and *t c*), and finally forcing their way between the lip-cells (*w z*) the spores make their exit through the permanent pore thus formed.

The special instance which has been selected as an illustration of the development of the female organ, although it may be considered typical of the process as it occurs in the family generally, does not, as has been noted, represent the invariable course of development in all cases, when the details of the successive changes are considered; and it will therefore be necessary to compare the processes described with the corresponding conditions presented by certain other genera.

The exact point of origin of the bud which is to develop into the perithecium, in so far as concerns its position with reference to the cells of the receptacle, is, as has been previously mentioned, subject to many variations in the different genera, although that which has just been described is the most common. The genus Amorphomyces, to which reference has several times been made, presents the most essential difference in this respect; since the terminal and subterminal cells of the germinating spore constitute the primordial cells of the procarpe and of the perithecium proper, respectively; the latter dividing and growing up around the former as in the case of Stigmatomyces just described (Plate V, fig. 23, *d*, *c*). In several other cases, as in Rhadinomyces and Enarthromyces (Plate III, figs. 13–18), the female organ first appears as a free bud, developed from a cell, not necessarily the sub-basal cell, of the receptacle; and this bud having become divided by a cross partition into two superposed cells, the same changes which have already been described in detail, take place in essentially the same way, as will be presently noted.

A very remarkable variation from the method above described by which the primordia of the perithecia and sexual organs arise from the receptacle, occurs in Zodiomyces; a genus in which these organs, instead of originating as superficial outgrowths, are formed as buds from a layer of cells which line the bottom of the cup-like extremity of the receptacle. This cup-shaped portion, though open at maturity, Plate XXIII, fig. 8, originates as a closed cavity below the base of the primary appendage, fig. 5, *x*, which becomes open as a result of the destruction of the superficial cells above it, which is effected by numerous sterile appendages that make their way out, fig. 6, *y*. The cells which give rise to the perithecia are thus primarily derived from the central parenchyma of the body of the receptacle. The course of development of the perithecia, in this instance, does not appear, however, to differ very materially from that already described.

Apart from these differences in origin, the development of the female organ corresponds very closely in all the genera, up to the formation of the procarpe, with certain differences of detail; and in all cases the mature procarpe consists, as in Stigmatomyces, of the three essential parts above mentioned. The carpogenic and trichophoric cells are practically identical in all cases; but the trichogyne is subject to very considerable variations, even in the same genus. In its most simple form it is unicellular, as in the case of Stigmatomyces, without branches, and of no great length. Other unicellular trichogynes may be more or less branched, consisting of an abruptly enlarged portion from which radiate more or less irregular short lobes or branches, which are the receptive portions, sometimes quite numerous, as in the genera Amorphomyces and Dimorphomyces (Plate V, figs. 4, 5, 20, and 24), Camptomyces (Plate VI, fig. 4); and, to a less extent, in Peyritschiella and Dichomyces, both of which have trichogynes which are nearly simple or but slightly lobed (Plate VI, figs. 16 and 32). A similar trichogyne appears to be characteristic of Dimeromyces (Plate IV, fig. 17); but sufficient material is needed to determine this point.

The multicellular trichogynes, which are the more numerous, may be branched or simple, even in the same species, and sometimes reach a very remarkable degree of development; becoming many times septate and copiously branched, the free extremities being either straight or more or less definitely spirally twisted (Plate II, figs. 1–5, *t r*, and Plate XXI, fig. 15). The terminal portion of the trichogyne alone is receptive, and it is this part which is subject to the spiral twisting, the most striking instance of which occurs in the genus Compsomyces (Plate XI, figs. 9 and 10), well developed specimens of which, like that represented in fig. 9, producing more highly developed trichogynes than are found elsewhere in the family. In all cases the receptive tips have the same refractive appearance when mature that is noticeable in the corresponding organs of the Florideæ, and the continuity of the protoplasm of successive cells is readily demonstrated, as in other parts of the plant. However highly the trichogyne may be developed, it disappears with great rapidity as soon as fertilization has been accomplished, collapsing and breaking off, its point of insertion sometimes remaining as a scar-like prominence (Plate II, fig. 14, *t r*); while less frequently its base becomes somewhat indurated and persists even in the mature individual (Plate XXI, fig. 12 and Plate XVII, fig. 18). In a majority of cases, however, all signs of it have disappeared at an early stage in the development of perithecium after fertilization.

The process of fertilization, in so far as concerns the adherence of the antherozoids to the trichogyne, has been already referred to; the former in almost all cases being carried to the latter, whether they are discharged directly upon it or make their way to it by floating passively through the water, which, as we have seen, is apt in a majority of instances to surround the individuals while their hosts are hiding in moist situations. The genera in which the antherozoids are exogenous in origin probably form an exception to this rule, and the transfer may be effected as above described (p. 210). At all events, the trichogyne in the genus Zodiomyces always grows downwards (Plate XXIII, fig. 16) as it develops and seems to seek the antherozoid which is almost invariably found attached to its tip (figs. 17, 18), and it is only after contact with the antherozoid that it turns upward as is shown in the two last-mentioned figures. In this instance several specimens have been examined in which there seemed to have been a definite conjugation between the two organs, as in fig. 17; but as a rule this union cannot be satisfactorily demonstrated owing to the very small size of the male element.

The fertilized trichogyne usually disappears before any definite change takes place in the other cells of the procarpe; but soon after this disappearance the divisions of the carpogenic cell already described succeed one another with considerable rapidity, and correspond at first in all the genera so far as they are known. The carpogenic cell divides by two transverse septa into three superposed cells, the superior and inferior supporting cells and the ascogonium; and the latter, at least in many of the instances observed, becomes separated into a lower sterile part which has been above described as the secondary inferior supporting cell; while the upper part either remains without further division, constituting the single ascogenic cell, as in Amorphomyces, Sphaleromyces, Peyritschiella (Plate I, figs. 28, 29) and a few other genera; or becomes divided
pos nto two such cells, as in Laboulbenia (Plate I, fig. 35, *a c*) and in many other genera
in esse hich this is the usual number. Less frequently the number of ascogenic cells may
A ve as in the case of Stigmatomyces above described; while in only one genus,
primordia ges, have *eight* such cells been definitely observed. Although the number of
Zodiomyces ; ells is moderately constant in a given genus, it does not appear to be inva-
growths, are for ave seen rare instances in which two were present in forms having typi-
extremity of the while in a single instance a specimen of Rhadinomyces was observed
Plate XXIII, fig. 8 distinct within the perithecium in place of the usual four; a con-
appendage, fig. 5, *x*, w o the abortion of one of the original products of the division of
ficial cells above it, whic
way out, fig. 6, *y*. The genic cell, though generally similar in most of the genera, is
derived from the central pa s, and the position which it occupies in the cavity of the
development of the perithe haracteristic in given instances. In Rhizomyces, for exam-
very materially from that al ly in relation to the axis of the perithecium, so that the
Apart from these differenc e represented in Plate III, fig. 3; while in *Chitonomyces*

paradoxus it is nearly horizontal, so that the asci growing inward, downward, and upward are much bent and distorted when mature. When they occur in pairs the ascogenic cells are more or less symmetrically arranged, and when there are but two, lie facing one another in a plane at right angles to that in which the perithecium is flattened. Where there are two or four pairs the perithecium is but slightly if at all flattened, and the ascogenic cells lie facing one another: one anterior, one posterior, and two lateral, or approximately so. The form of the ascogenic cell is subject to little variation, being, as a rule, oval in outline in face view; but in a few genera it is much elongated, as in Amorphomyces (Plate IV, figs. 25–28), or Sphaleromyces, and in the former case may possibly become divided by a transverse septum in certain instances.

In Stigmatomyces, as has been mentioned, the asci bud from the ascogenic cell, alternating first from one side, then from the other; so that, as a result, two definite rows are formed, such as are illustrated in Plate IV, fig. 18, in Plate I, fig. 38 (at the left), and in Plate III, fig. 1, all of which represent dorsal views of the ascus mass, the ascogenic cell lying away from the observer and being consequently invisible. In the last mentioned figure, a slight irregularity is noticeable from the fact that an extra ascus has been abnormally produced at one point lying in the median line between the two rows normally formed. The most conspicuous exception to this biseriate arrangement of the asci is found in the genus Moschomyces, the very large ascogenic cell of which gives rise to an enormous number of asci arranged in many vertical rows; and, although such variations are exceptional, there seems in a few other cases to be some slight variation from the biseriate type.

The form of the ascus at maturity is subject to unimportant variations, being practically identical in nearly all the genera. It varies from a somewhat stout and short type (Plate VIII, fig. 28; Plate II, fig. 11; Plate I, fig. 25) to more slender forms (Plate XI, fig. 17 and Plate XXIV, fig. 9). At the time when the spores are fully formed, the ascus is commonly short-stalked; but as the latter begins to be pushed upward by the ever-increasing mass of asci below it, the basal part often becomes drawn out into a long slender pedicel, which finally sloughs off as the ascus wall itself begins to dissolve. In almost all cases the asci are four-spored at maturity, as in the majority of the figures cited, and are distinctly flattened, the only known exceptions to this rule being presented by the two genera, Moschomyces (Plate XI, fig. 17) and Compsomyces, in both of which they are definitely eight-spored and more nearly cylindrical. The asci are never naturally discharged from the perithecium, having wholly dissolved some time before they reach the terminal pore of the latter; but by crushing perithecia in some aqueous stain like eosin, perfect asci in various stages of maturity are very easily obtained, either free or still attached to the ascogenic cell. Before they separate from their attachment, the asci are generally much distorted by mutual pressure, but assume a more or less regular form after they have become free.

As the ascus mass or masses increase in size, their upward pressure soon destroys the superior supporting cell, as we have already seen; while their downward pressure in most instances destroys the primary and secondary inferior supporting cells, at the same time freeing the ascogenic cells from one another, if there are more than one; so that the latter eventually lie in the cavity of the perithecium, free and unconnected with any other cells. In some cases the inferior supporting cell persists after the ascogenic cells have freed themselves from their attachments, as is the case to a certain extent in Stigmatomyces, the supporting cell in this instance being so placed as to be protected by the basal cells of the perithecium which surround it. In a similar manner the inferior supporting cell in the species of Laboulbenia allied to *L. palmella* persists permanently, for the reason that it is surrounded by the lower series of wall-cells of the perithecium, which are modified to form a perithecial stalk, and corticate it completely. The further destructive action of the ascus masses on the parietal and canal cells of the perithecium has already been described in connection with Stigmatomyces.

With the formation of the spores and the disappearance of the ascus-wall, the history of the female organ and its products is completed; but, as we have seen, the changes which it has undergone are accompanied by changes in the cells of the perithecium proper which are also subject to certain variations from the course of development described as characteristic of Stigmatomyces.

In all cases the perithecium proper, by which is meant all portions of it exclusive of the female organ and its products, originates as a single cell (Plate I, fig. 10, *c*; Plate III, fig. 14, *c*) that lies wholly below the terminal cell which gives origin to the female organ in the manner above described. This cell, which has already been alluded to as the primordial cell of the perithecium, divides, in cases which have been followed out and probably in most if not in all of the other genera, into two cells more or less obliquely superposed (Plate I, fig. 11, *c′ c″*, and Plate III, fig. 15, *c′*, *c″*); the divisions of which follow in general the same course which has been described in Stigmatomyces, and may be briefly recapitulated with reference to the genus Enarthromyces. Comparing figs. 15–17 of Plate III, which represent three successive stages of development, we have in fig. 15 the condition just referred to, in which the primordial cell of the perithecium (fig. 14, *c*) has divided into two obliquely superposed cells (*c′*) and (*c″*). In fig. 16 each of these has divided, (*c″*) into the stalk-cell (p) and an upper cell (z); while the cell (c') has separated into a lower cell (h), the secondary stalk-cell, and two upper cells (i, i), only one of which is seen in the figure, the second lying opposite it on the reverse side. The two cells (i, i) and the cell (z) then continue to grow upward around the base of the primordial cell of the procarpe (d), and the cell (z) becomes separated into a lower cell (fig. 17, o'), the posterior basal cell, and an upper cell (n); while of the cells (i, i), one becomes separated into a lower (o) and one upper cell (n), the other into a lower (o) and two upper cells (n, n). The two cells (o, o) constitute the anterior basal cells, and thus, together with the posterior basal cell (o'), give rise to four cells (n, n), two only of which are seen in the optical section (fig. 17). The cells (n, n) in the figure cited have already grown up around the base of the primordial cell (d) of the procarpe, the base of which is completely enclosed, and is separated from the free portion above as a distinct cell (f), the carpogonium. In fig. 18, the cells (o, o') have also given rise to the inner series of perithecial cells which develop as in Stigmatomyces, and are eventually all destroyed.

The free part above has in the mean time developed a terminal trichogyne ($t\,r$), which is separated from the carpogonium by the trichophoric cell (e''). The four cells (n, n) then continue to grow upward, and their upper portion becomes separated by a septum. This upper portion then in turn divides into an upper and a lower part, and the process is repeated several times, until the number of wall-cells characteristic of the genus has been produced. During the formation of these wall-cells a corresponding development of the inner series of perithecial cells, fig. 18 (not shown in fig. 17), has taken place, resulting in the formation of the parietal and canal-cells previously described, which correspond in number to that of the wall-cells, and, like them, are derived as upgrowths from the three basal cells (o, o, and o').

The number of wall-cells which occur in a single row is usually four, as in Laboulbenia and many other genera, while in Moschomyces, Compsomyces and a few others, the number is five. As far as I am aware, the genus Ceratomyces (Plates XXIV and XXV) is the only one in which the number may not only vary in different species, but also in individuals of the same species. In this genus the perithecium attains in some instances a most extraordinary development, and in *C. rostratus* the number of wall-cells in a single row may reach seventy. These rows of wall-cells may be either straight, or spirally twisted, as in *Stigmatomyces Baeri*, or in some of the species of Laboulbenia (Plate XIV, fig. 27; Plate XX, fig. 19), and vary in specific cases both in form, relative size, and position. For example, in the genus Laboulbenia, the lower members of the series of wall-cells, as a rule, lie opposite the ascogenic cells; but in some species they may lie wholly below them, being prolonged into a stalk, as in *L. longicollis*, *L. Kunkeli*, and their allies (Plate XIX, fig. 6, etc.; Plate XVIII, fig. 9). In such instances the ascus and spore masses, as they lie in the perithecium, are almost completely surrounded by the sub-basal cells of the series. In *Stigmatomyces Baeri*, on the other hand, the basal cells of the series occupy a corresponding position (Plate I, fig. 23), while in *S. virescens* (Plate VIII, fig. 2) the basal cells of the perithecium (not the wall-cells) extend up above the ascogenic cell and the base of the ascus mass. In a few cases the wall-cells may give rise to projections or definite appendages, which originate as lateral branches. Such a projection from one of the basal wall-cells is found in *Chitonomyces spinigerus* (Plate VIII, fig. 16). *C. appendiculatus* offers an example of a similar projection from one of the sub-basal cells; while instances of outgrowths from the terminal cells of the series are sometimes found, as in *Stigmatomyces virescens* (Plate VIII, fig. 1), *Laboulbenia Gyrinidarum* (Plate XXII, fig. 37), and a few other cases. In the genus Ceratomyces, multicellular appendages may be thus developed which may be even copiously branched (Plates XXIV and XXV); but in all the instances cited these structures are only of specific importance.

The terminal cells of the series of wall-cells have been already referred to as the "lip-cells"; since it is between them that the spores eventually force their way out from the perithecium. These lip-cells are often somewhat modified in shape, and are not, as a rule, similar and symmetrical, though sometimes so. They are usually modified to form a more or less elastic margin to the pore; as, for example, in some species of Laboulbenia (Plate II, fig. 14), the lip-cells of which are in general very irregular in form, and have their walls so modified as to give them great elasticity and thus regulate the discharge of spores. In this genus, and perhaps in some others, there is a peculiar structure at the apex of at least one of the lip-cells, represented in the figure just cited at (x), which may perhaps act as a valve, allowing the lip-cell, the cavity of which it terminates, to be more readily compressed, and at the same time to recover its form as soon as the pressure is removed. That the spore discharge may be regulated by modifications of cells other than the lip-cells has already been seen in the case of Stigmatomyces (Plate I, fig. 24); and in Sphaleromyces (Plate III, fig. 1), several sets of cells appear to assume this office. Rhadinomyces (Plate IX, fig. 13) affords an instance in which the lip-cells perform this function without any considerable modification.

Turning now for a moment to the inner series of cells which have been described as arising from the basal cells of the perithecium within, and alternating with, the wall-cells, we have seen that in Stigmatomyces their development follows that of the wall-cells, although quite independent of it, and the same is in general true of all the genera. In forms in which, like Ceratomyces, the wall-cells become very numerous, a corresponding increase in the number of the canal-cells takes place; although the number formed may be fewer, as is indicated in Plate XXIV, fig. 8, which represents the growing apex of a perithecium in section, the divisions of the wall-cells (*w c*) being evidently more numerous than those of the canal-cells (*c c*). There seem, also, to be certain variations in the relative position of the canal-cells. In Sphaleromyces, for example (Plate III, fig. 2), the cells (*x*) are probably the lower canal-cells which have, by pushing between the wall-cells, assumed an apparently external position; and some similar modification of the more normal course of development may account for the peculiar arrangement of the cells at the tip of the perithecium in this genus, when seen antero-posteriorly as in fig. 1. It is not improbable that there are, in certain cases, variations of the course of development above described: yet in all the instances in which a careful examination has been made, it seems to correspond in all essentials.

While the wall-cells of the perithecium have a definite protective function, persisting and forming an envelope around the ascus and spore masses, and regulating and directing the dispersion of the spores; the inner series, as we have seen, performs an entirely different function which may well be compared, in so far as concerns the cells which I have called the parietal cells, to that of the so-called tapetal cells in the sporangia of the higher cryptogams; while the cells which I have called the canal-cells bear a similar resemblance in function to the neck-cells, for example, of an archegonium. It is needless to say, however, that there is not the slightest homology between the two structures in either case. The function then of the parietal cells is to make room for the developing ascus masses, and allow them to float free within the cavity of the perithecium; while that of the canal-cells is to afford a channel of exit by means of which the spores may make their way out through the pore of the perithecium. For, as we have seen in the case of Stigmatomyces, which is typical of the family generally, the growing ascus masses press upon and destroy not only their own connections with other cells above and below, but also the thin-walled parietal cells around them; while the mass of mature spores, which is constantly being pushed upward, has a similar effect upon the canal-cells, the latter, as a rule, having disappeared entirely when the spore discharge commences. In exceptional cases, as in that of Stigmatomyces, the walls of certain of the canal-cells (Plate I, fig. 24, *n c*) appear to become somewhat indurated, and to regulate, to some extent, the spore discharge; but I have observed no other instance than the one just mentioned, unless it be in the case of Sphaleromyces (Plate III, fig. 1) above alluded to.

It should be mentioned in this connection that in two genera (Dimorphomyces and Dimeromyces) not only do the parietal cells lose their individuality as cells, but also the basal cells of the perithecium, the stalk-cell, and the secondary stalk-cell; so that the cavity of the stalk-cell and that of the body of the perithecium are continuous when the latter is fully mature. In these cases, as in many other genera, the cavities of the lower wall-cells of the perithecium are gradually obliterated, as the spore mass increases; the terminal and subterminal wall-cells often being the only ones, in old individuals, in which the cell cavity can be made out.

Before leaving the subject of the derivation of the two series of cells which constitute the outer and inner portions of the body of the perithecium proper, and of their relation to the cells below, it must be confessed that my first impression concerning the origin of the inner series was that they arose from the primary wall-cells (Plate I, fig. 15, *n*), through the formation of longitudinal tangential septa, it being a matter of great difficulty to make out their exact position and relations at the earliest period of their development; and it was not till the protoplasmic connections of both the outer and inner series was observed with some exactness, in specimens of Laboulbenia the cells of which had been separated by treatment with potash, that the true condition of things suggested itself. These connections, in so far as they have been absolutely seen in given instances, are represented in figs. 16 to 18 of Plate II, which should be compared carefully with the account above given of the successive origin of the stalk-cell, the secondary stalk-cell, the basal cells, and the wall-cells; the lettering corresponding in general to that of the figures above cited on Plates I and III. In figs. 16–17 (Plate II), the parietal cells, as well as the inferior supporting cell below the ascogenic cells, had been destroyed, so that the protoplasmic connection with these cells had also disappeared; but in fig. 18, which represents a young individual, some of them were distinctly visible, and it was apparent that the inferior supporting cell (*i s*), and the two anterior basal cells (*g*) and (*d*), were definitely connected with the secondary stalk-cell (*h*), and that the two visible parietal cells (*p c*) were similarly connected with the two anterior basal cells. A second preparation showed with equal distinctness that the posterior basal cell (*o′*) was similarly connected with one of the parietal cells. It was, however, impossible to determine which of the two anterior basal cells gave rise to two and which to one parietal cell; yet it is safe to assume that the same cell (*d*) which (fig. 17) gives origin to two wall-cells, is also connected with two parietal cells. In the preparation, as will be seen (fig. 18), three connections were visible from this cell: one of which was evidently with a parietal cell, another with the wall-cell (*f*), the third running beneath and connecting on the opposite side either with a wall-cell or with a parietal cell. The fourth connection could not be distinctly made out, and may well have been broken by the crushing which was resorted to in order to separate the cells from one another. The connections of the basal cells with the wall-cells, as they are represented in figs. 16 and 17, are very readily demonstrated. It will be noticed that in fig. 17 a portion of the posterior basal cell (o'), as well as its connection with the wall-cell (i), is indicated through the anterior basal cell (d), the connections of which with *two* wall-cells (e) and (f) are very distinct. The connection of the basal cell (g), shown in fig. 16, is not visible in this instance.

Having considered these special cases and their modifications as far as they are at present known, it may not be superfluous, even at the risk of tedious repetition, briefly to summarize the general development of the perithecium and of the structures which it contains, since it involves matters of such considerable importance that a clear understanding of it is essential.

Summary of the development of the perithecium and of the female sexual organs. The perithecium arises as a lateral, rarely as a terminal organ, and consists at an early stage of two superposed cells: an upper, which is alone concerned in the formation of the female organ, and a lower, from which is developed the perithecium proper. The upper cell elongates by terminal growth, and is converted into the procarpe through the formation primarily of two cross partitions, by which it is separated into a lower portion, the carpogenic cell, always a single cell; a middle portion, the trichophoric cell, also always a single cell, and a terminal portion, the trichogyne, which may consist of a single cell, or, through the formation of cross partitions often accompanied by copious branching, of very numerous cells. The free extremities only, of the trichogyne, are receptive, and conjugate with the antherozoids which adhere to them. As a result of this union, the trichogyne soon withers and disappears, while the carpogenic cell undergoes a series of divisions. First, by the formation of two transverse septa, it is separated into three superposed cells: the upper and lower constituting the superior and inferior supporting cells, respectively, which undergo no further changes; while the middle cell of the three, known as the ascogonium, divides, by more or less oblique partitions, into from two to nine cells, one of which lies at the base of the others and is called the secondary inferior supporting cell; while the one, two, four, or eight remaining cells are known as the ascogenic cells. Each ascogenic cell then begins at once to produce asci, which bud from it downward outward and upward, and soon becomes quite free in the cavity of the perithecium; destroying, as a rule, both supporting cells, and eventually the remains of the trichophoric cell, as well as the cells of the perithecium proper (parietal and canal cells) which lie immediately about and above it.

The cells which make up the body of the perithecium proper, all arise, on the other hand, from the primordial cell of the perithecium, which lies wholly below that of the procarpe. Its first division, with a few possible exceptions, separates it into two more or less obliquely superposed cells. From each of these cells upgrowths arise; one from the lower and two from the upper, which still retains its protoplasmic connection with the primordial cell of the procarpe. The lower becomes separated from its single upgrowth, and constitutes the primary stalk-cell; while the upper is similarly separated from its two upgrowths and constitutes the secondary stalk-cell. There are thus two stalk-cells surmounted by three upgrowths which have become separated from them and form three distinct cells, that begin to grow up around the base of the primordial cell of the procarpe. The body of each of these cells constitutes one of the three basal cells of the perithecium. From these three cells then arise eight upgrowths, four of which are external, while the remaining four are included by them and form an inner series. As a result of continued terminal growth, accompanied by the formation of a variable number of septa by which the growing tip is successively separated from the portion below, an envelope is formed which completely encloses the female organ and its products: consisting of an outer series of cells arranged in four rows, each made up of a definite number of superposed cells, which constitute the wall-cells of the perithecium; and of an inner series of cells similarly arranged, the lowest members of which have been called the parietal cells, while those above them are termed the canal-cells. Of the two series, the outer forms the perithecial wall, the inner being destroyed, with unimportant exceptions, to make room for the ascus and spore masses, and to provide a channel through which the spores may pass to their point of exit between the apposed terminal, or lip-cells, of the outer series.

General Relations and Character of the Cells. We have already seen that the gelatinous membrane which surrounds the ripe spore persists, in the growing and in the mature plant, as a general envelope within which the cells undergo their independent divisions and modifications. This envelope, though thin, is tough and very impervious, resisting the action of reagents and staining fluids in a manner which greatly increases the difficulties associated with any attempt to observe the nuclear and other changes that take place in the cells within it. In some cases it may be separated without much difficulty, by treatment with potash, or even, when the specimen is dry, by the application of water; the action in either case resulting in the swelling of the outer layers of the cell walls and the bursting of the envelope, through which the cells themselves may protrude while still connected, as is represented in Plate III, figs. 10 and 11. In other cases the envelope appears to be more firmly and intimately connected with the outer layers of the cell walls, and, though always readily demonstrated by crushing, is not affected by the application of potash.

The cells of the Laboulbeniaceæ, with the exception of those which lie within the wall-cells of the perithecium, and of the receptive portions of the trichogyne, are characterized by possessing thick walls that, when treated with potash, are readily seen to consist of a number of layers, the outer of which are less dense, and soon become swollen and gelatinous. In a majority of instances they do not seem to be connected with the general surrounding envelope by any special organs of attachment; but, in certain cases, the innermost layers of the cell wall give rise to fibrillæ which, passing through the outer layers, are attached to the inner surface of the envelope. The latter, in such instances, is usually more or less conspicuously punctate, especially in cases in which it is suffused with some dark color, as, for example, in the sub-basal cell of *Laboulbenia Oberthuri* (Plate XXII, fig. 39). It may be mentioned in passing that the suffusions, usually of black or brown, which characterize many of the species, appear to be for the most part, if not entirely, confined to the envelope; the cell walls within them being, in general, hyaline.

In some cases, however, this blackening involves at least the outer layers of the walls themselves, as, for example, in the ordinary "foot." The same is true also in cases where, for instance, the septum separating two cells is thus modified. This occurs very frequently in the appendages of Laboulbenia and other genera, the blackening extending inward so that it appears to form a disc with a central perforation corresponding to the passage through which the protoplasm of adjacent cells is continuous. These blackened septa were noticed by Berlese, and described in his account of *Laboulbenia armillaris* as "black discs or rings," the nature of which was not determined.

The fibrillæ just mentioned, which, in the normal cell wall when it is viewed in optical section, give rise to the appearance described by Istvanffi as being due to the presence of "pore-canals," are more or less twisted when freed by treatment with potash, and are characterized by the presence here and there of granular thickenings (Plate III, figs. 11 and 12), their extremities being attached to the inner surface of the general envelope in a fashion that varies in different instances. In *Laboulbenia Kunkeli*, for example (Plate XVIII, fig. 9), they are characteristically attached in short rows, running transversely in the sub-basal cell, but less regularly disposed in the cells above it. In other cases they may adhere in more compact groups, as in *L. Nebriæ*, or singly without any definite and characteristic aggregation. These points of attachment tend to become dark-colored, especially in areas where the envelope itself is suffused, and give to the latter the punctate appearance peculiar to many species. The presence of these fibrillæ has not been definitely determined in genera other than Laboulbenia, and even in this case, although so conspicuous in many species, they no not seem to be of invariable occurrence.

The substance of the cell walls as well as of the general envelope give, when treated with iodine and sulphuric acid, or with Schultze's chloroiodide of zinc solution, no blue color.

The contents of the cells, especially those of the receptacle, are usually more or less characteristic while the plant is alive, and consist of rather dense granular protoplasm, in which, as a rule, certain highly refractive spherical oily masses are conspicuous. In some instances these masses are few in number, one or more of them being often very large (Plate V, figs. 4 and 5), while again they may be more numerous and uniform in size, completely filling the cells, as in the case of *Laboulbenia Harpali*, *L. Philonthi*, and many others. In general, however, they are more or less variable in size, and present the appearance indicated in fig. 15, Plate II. In glycerine they soon become indistinguishable, and are thus not represented in the accompanying figures, which were drawn, with few exceptions, from glycerine preparations.

The protoplasm of adjacent cells, the origin of which is the same, is connected by a conspicuous strand of the same substance, which passes from one cell to the other through a well marked perforation of the cell wall, the connection being demonstrated with great ease by treatment with potash and subsequent staining (Plate III, figs. 11–12; Plate II, figs. 16–18). In many instances, also, it may be seen in the living plant without the use of reagents. This protoplasmic connection is found in all the cells, including those of the trichogyne, when this organ is multicellular. In many cases in which the cells had been separated by potash, and the connecting protoplasmic strand stretched between them, I have seen a slight enlargement like that indicated in fig. 12, Plate III, recalling the similar structure through which the strands of protoplasm pass in the Florideæ. I have, however, been as yet unable to determine its exact nature.

A single, usually large, nucleus is found in the contents of every cell, and is often readily seen without the use of reagents; while in other cases it is by no means easy to demonstrate, owing to the difficulty which is usually experienced in staining the cell contents. The nuclei are spherical or nearly so, and usually contain a large nucleolus (Plate V, figs. 20 and 24; Plate I, figs. 7, 15, 16; Plate II, figs. 3 and 13). The nuclear changes accompanying cell division have not been determined; but from the occurrence of conditions like that represented in fig. 7, Plate I, it would appear that the nucleus divides, and that the two resultant nuclei separate before the wall is formed between them.

Although a considerable amount of time has been expended in an endeavor to determine the nature of the nuclear changes which take place in the female organ during and after fertilization, I do not as yet feel in a position to make any definite statement concerning them, and have not ventured to give any drawings of the often-conflicting phenomena observed. Any one having an opportunity to study an unlimited series of specimens of *Stigmatomyces Baeri*, for example, in a fresh condition, would probably meet with no great difficulty in determining these matters; since from the considerable size of this species, its densely gregarious habit, and the nature of its trichogyne, it is peculiarly well adapted for this purpose. Of all the Laboulbeniaceæ none, however, is better suited for study in these respects than the form described below as *Enarthromyces indicus*, by reason of its large size and great simplicity; but, as a rule, observations of this nature are made with the greatest difficulty, owing chiefly to the lack of unlimited material in the proper condition of development and the impervious character of the envelope, which so seriously interferes with the action of stains.

Abnormal Morphology and Development. In examining a large body of material, cases are often met with in which the course of development, usually characteristic of a given species, is modified in various ways, and some of these modifications are sufficiently curious to call for mention in this connection. Among the simpler instances, abnormal septation in individuals of the cells, for example, of the receptacle, frequently occur in genera like Laboulbenia, in which the latter consists, with few exceptions, of an invariable number of cells. Such an instance is represented in fig. 9, Plate XX, the basal and sub-basal cells being thus divided, while in some cases a much more complicated cell division has been observed.

An abnormal production of branches in the appendages, due, as a rule, to breakage and subsequent renewal, is very common, especially in species in which the latter are more or less filamentous, and result in an irregularity of form and branching which does not occur in normally developed plants. The multiplication of appendages, normally single or definite in number, sometimes occurs, however, not as a result of injury; as in Stigmatomyces, the normally single appendage of which is rarely furcate near the base, each branch becoming a functional appendage.

The same is true in regard to the production of accessory perithecia. While in many forms more than one is usually produced, in a majority of genera it is typically solitary. In the latter class, however, instances are sometimes met with of the production of accessory perithecia. This abnormal condition has been seen several times in the genus Ceratomyces (Plate XXV, fig. 7), and occurs also in Chætomyces, Corethromyces, Stigmatomyces, and a few others. In Rhachomyces is found the most frequent and remarkable instance of this nature, the accessory perithecia arising in this instance in two distinct ways. In the one case, two may occur side by side as is represented in Plate X, fig. 22, or, through the proliferation of the receptacle below the base of the perithecium first formed, a second may arise a short distance above it (Plate XII, fig. 2). The same process may even be repeated, so that two or even three accessory perithecia may succeed one another, as in fig. 14 of the same plate. In the last mentioned cases the proliferation, usually, if not invariably, follows the abortion of the perithecia first formed, the trichogynes of which have, for some reason, failed to become fertilized.

One further instance of the abnormal occurrence of perithecia may be mentioned which has several times been noticed in the genus Peyritschiella. In all but one of the known species of this genus, the receptacle is terminated by a single perithecium (Plate VI) which may exceptionally be replaced by two. In the species referred to (*P. geminata*, Plate VI, fig. 7), the receptacle usually bears a terminal pair of perithecia. When, however, the individuals have grown under rather unfavorable conditions, as, for instance, near the extremities of the anterior pair of legs of their host, the lower transverse cell rows of the receptacle may give rise externally to several additional perithecia, which develop normally with the others.

To a similar failure of fertilization is also to be attributed the usually marked increase in the production of antheridia in such cases, which has been previously noted. Such antheridia are, as a rule, formed normally on the appendages; but in certain instances, on the other hand, this increase is effected by an abormal process, as a result of which, accessory antheridial branches take the place of the perithecium, growing from the cells at its base (Plate II, fig. 8). In some cases the branches produced under these circumstances may grow up through and within the atrophied perithecium, emerging between its terminal cells, as is represented in Plate II, fig. 9. A condition similar to this is figured by Peyritsch (1873, Plate II, fig. 11), the protruding filament having been mistaken by him for a trichogyne. A specimen in which a similar growth from within the base of the perithecium has resulted in the production of large numbers of branches is represented in Plate II, fig. 10. In this instance the abnormal growth had apparently followed an injury, by which the upper half of a normally matured perithecium had been destroyed. Such examples well illustrate the fact that the cell series of the perithecium proper are merely eight modified, but independent, filaments which under abnormal conditions may be replaced by or associated with typically filamentous growths similarly derived from the basal cells.

In very rare instances individuals are met with in which a typical antheridial appendage, in a normally bisexual form, is substituted for the female organ, the substitution being accompanied by a great increase in the number of antheridia produced. An abnormal male individual of this kind is represented in Plate II, fig. 7, the two appendages being in general normal even to the formation of the blackened insertion cells.

We have seen that in general the spores are discharged in pairs, and that, as a rule, and sometimes invariably, they adhere to the host and develop side by side. It is an interesting fact which may possibly have some bearing on the derivation of the diœcious from the monœcious forms, that in certain instances one member of the spore pair may normally, or not infrequently, become atrophied, or produce a smaller and weaker individual than the other. In the case of *Laboulbenia inflata* the atrophy of one of the spores, after it has reached an inconsiderable development, seems to be an invariable rule, as far as I have had an opportunity for observation, and groups of this species, when detached with a portion of the integument on which they are growing, show the condition of things represented in fig. 5, Plate III, the atrophy being apparent even at an early stage.

Normal Variations. Like other groups of plants, the Laboulbeniaceæ are subject to normal variations in form, size, color, etc., which are partly inherent and partly due to the action of external causes. In individuals growing under identical conditions, the variations are comparatively slight, and are expressed by inconsiderable differences in gross size, or variations in the relative development of different parts, often coupled with differences in color, which are, however, in general, due to the varying age of individuals. Forms, for instance, which, when young, even when they are sufficiently advanced to discharge their spores, are hyaline or pale straw-color, may become, as their age increases, dark amber-brown or suffused, wholly or in part, with blackish or smoky-brown shades.

Among the external causes which influence variation, the most important are associated with the character of the host, its size, and the position in which the parasite grows upon it. The color of the host, for example, often influences that of the parasite, the same species being sometimes very dark or nearly opaque on hosts with a dark or black integument, while they are pellucid, or nearly hyaline, on hosts of a lighter color, such differences in color being independent of differences in the age of the individuals in question.

Variations in size among different specimens of a given species are often influenced by two factors, namely, the size of the host and the position in which the parasite has become attached. Thus small specimens of a given species of insect will, as a rule, bear smaller parasites than larger ones, and the same is true of smaller species in a varied genus, for example, like Platynus, almost all the members of which are liable to be infested by a single species of Laboulbenia. In regard to differences dependent on the position of growth, it is usually true that individuals growing near the circulatory centres of the host, being presumably better nourished, are commonly distinctly larger. The largest individuals that I have observed, for example, have been found growing on the thorax or prothorax about the base of the two anterior pairs of legs, while, on the same insect, those which inhabit the tips of the elytra, or of the legs, include the smallest specimens. It should also be observed that individuals growing in situations in which they are exposed to the most unfavorable conditions are apt to be thick-set, short, and stout, with short appendages. This is true, for example, in specimens of *Laboulbenia elongata*, *L. subterranea*, and various other species, when they occur, as they not infrequently do, on the mouth parts or near the tips of the legs of their hosts, the difference in general habit in such cases being often so great that such forms might easily be mistaken for distinct species. The same short, stout habit, it may be mentioned, characterizes species which are found normally in such situations and not elsewhere; as, for instance, in the case of *Laboulbenia parvula*, *Peyritschiella minima*, and others, that are, as a rule, found near the extremities of the legs, and only exceptionally in other situations.

The *rate of growth* of the Laboulbeniaceæ and the *duration of their life period* are matters concerning which it is not easy to make exact observations, owing, on the one hand, to the difficulty of obtaining freshly hatched hosts that have not been exposed to infection, and, on the other, to the uncertainties connected with the determination of the exact time at which the infection of the fresh hosts is accomplished. By keeping in confinement insects which have been collected with spores upon them just germinating and distributed on definite areas, one may estimate with considerable accuracy the time necessary for the fungus to reach maturity. This period, in the species of Laboulbenia which I have thus cultivated, has proved to be from two to three weeks. It is doubtless variable, however, in different genera; those which are more complicated in structure requiring, for their full development, a period correspondingly longer; as may well be the case, for instance, in Rhachomyces or Zodiomyces. According to Peyritsch, freshly hatched flies confined with others infested by *Stigmatomyces Baeri* were found to bear mature individuals of the fungus in from ten to fourteen days, according to the temperature at which they were kept; and it is certainly improbable that many forms attain maturity in a much shorter period than this.

In regard to the *longevity* of individuals, it seems quite certain that those which have been mature in the autumn, may still produce spores during the spring and early summer; for although mature specimens which have hibernated are apt to be much damaged, and are often no longer fertile, fully mature individuals, evidently of considerable age, from their dark color, have been found on hosts still hibernating and collected by "sifting" early in the spring before the advent of warm weather. That the germinating spores and young individuals live over winter, attached to their hosts, in a dormant condition, is an undoubted fact; and it is upon the survival of these, rather than on that of the maturer individuals, that the fungus depends for its perpetuation. That a majority of forms, occurring in temperate climates, live throughout the summer and early autumn cannot be doubted; since one very rarely finds individuals that are old and infertile. When such cases occur, with few exceptions (as in Amorphomyces), the cessation of fertility has evidently resulted from some violent injury which has destroyed the perithecium, or a portion of it. From my own observations in this connection, I think that it may be safely assumed that, in a majority of cases, the life period of the parasite coincides with that of the host. The number of spores formed by a single individual must therefore be often enormous, in view of the fact that the ascogenic cells are continuously active during the growing season.

GEOGRAPHICAL DISTRIBUTION. Any intelligent discussion of the distribution of the Laboulbeniaceæ is hardly possible, since it is in North America only that their systematic study may properly be said to have commenced; yet, judging from the small number of exotic hosts which have been available for examination in connection with the preparation of the present monograph, it may be inferred that the warmer portions of the earth are quite as rich in representatives of the group as are the more temperate regions, while towards the colder northern latitudes they become distinctly less abundant. For, although specimens have been examined from localities as far north as Hudson's Bay and the Aleutian Islands, a comparatively small percentage of the hosts collected in these regions appear to be infested, while the reverse is true as the southern portion of the United States is approached. Notwithstanding the fact that the Carabidæ and Staphylinidæ, families of beetles which furnish by far the majority of the hosts at present known, are relatively much less abundant in tropical than they are in temperate regions, it seems highly probable that, in such localities, these orders are replaced by numerous other insects having suitable life-conditions, among which orders other than Coleoptera are doubtless largely represented. This is indicated by the fact that two among the small number of tropical forms at present known occur on such peculiar and unusual hosts as those of *Laboulbenia armillaris* and *L. Hageni*, the one a mite, the other a white ant. Southern California also furnishes an instance of the occurrence of a peculiar form on a host, Chilocorus, quite unrelated to any of the usual genera of insects thus parasitized, and it must be remembered that the Diptera have hardly been examined at all in this respect. It thus seems not improbable, in view of the above facts, and of the more favorable conditions for development and perpetuation which exist in the warmer regions of the earth, that we may look to them for a large, if not the largest, future addition to the group; for that the family is destined to be greatly augmented can hardly be doubted.

Including a small number of forms not enumerated in the succeeding pages, from lack of proper material for description, the total number of Laboulbeniaceæ known at present to exist includes one hundred and fifty-eight species, from which five perhaps might well be deducted as synonyms, distributed among thirty genera, three of which are undescribed. Of these one hundred and thirteen are, so far as known, confined to North America, eleven to Europe, eight to Africa, three each to Asia and South America, including Panama, while two are peculiar to Australia. On the other hand, nine are common to North America and Europe; two to North and South America; one to North America, Europe, Asia, and probably to Africa; one, the determination of which is perhaps doubtful, to North America, South America and Africa, including Madagascar; one to South America and Africa; one to North America, Europe and probably to Asia; and, lastly, one to Africa and Asia (Japan).

Turning to the genera, one finds that of the twenty-five which are known in North America, twenty are not recorded from other continents; that of the six genera known in Europe, two have not been found elsewhere; that of four genera known from Africa, two are indigenous; while of the two Asiatic genera, one is confined to that continent. Lastly, South America and Australia are each known to possess but the single genus Laboulbenia, which is universally distributed.

It is needless to remark that these statistics have little or no value as showing the actual relative distribution of the species and genera in the several continents, and they are merely given to indicate the possibilities of distribution in so far as our imperfect knowledge will permit. For convenience of reference a table giving in more detail the facts of relative distribution outlined above is here appended: —

Total number of species known to exist	158
“ “ “ “ described	152
“ “ “ North American species described	124
“ “ “ North American species known	130
“ “ “ European species	19
“ “ “ African species	14
“ “ “ South American species	6
“ “ “ Asiatic species	6
“ “ “ Australian species	2

Common to North America and Europe. — *Chitonomyces paradoxus, Rhadinomyces pallidus, Laboulbenia elongata, L. cristata, L. Gyrinidarum, L. luxurians, L. Nebriæ, L. subterranea, L. vulgaris.*

Common to North America and South America. — *Laboulbenia Guerinii, L. variabilis, L. polyphaga.*

Common to North America and Africa. — *Laboulbenia Catascopi, L. polyphaga, L. elongata* (?).

Common to South America and Africa. — *Laboulbenia Pheropsophi, L. polyphaga.*

Common to Africa and Asia (Japan). — *Laboulbenia proliferans.*

Common to North America, South America, and Africa. — *L. polyphaga.*

Common to North America, Africa, Europe, and Asia. — *Laboulbenia elongata.*

Common to North America, Europe, and Asia (?). — *Laboulbenia vulgaris.*

In regard to the distribution of single species in a given continent no data are available in any case except that of North America, where a wide distribution of given species is indicated. The common *Laboulbenia Nebriæ*, which is also known to occur in Europe, is found in America from Maine to Virginia, and west to Washington, extending northward to Alaska and the Aleutian islands. *Laboulbenia cristata* is another instance of a European form which is found in this country from Maine to Nicaragua, and several examples might be mentioned of species found throughout the United States and Mexico. The writer has unfortunately had no opportunity of collecting Laboulbeniaceæ on their living hosts outside of New England, and it is only in this limited territory that an approximate knowledge of their local distribution has been obtained; yet in general it may be safely assumed that the different species have a range practically coincident with that of their usual hosts. The occurrence of more or less cosmopolitan forms, like some of those mentioned above, which are doubtless more numerous than our present knowledge would indicate, has a certain interest when we consider that the possibilities of dissemination are so restricted as is necessarily the case where, as in the present instance, direct transfer from one living host to another is an essential factor in the perpetuation of the species. Of the more local occurrence of the Laboulbeniaceæ nothing further need be said at present, since, as has just been mentioned, it coincides with that of the special hosts of the group, which will be presently referred to.

Hosts of Laboulbeniaceæ. According to our present knowledge all members of the family are entomogenous, and occur only upon members of the orders Coleoptera, Diptera, and Neuroptera, with a single instance found among the Arachnida. Peyritsch in his third paper refers to an observation recorded by Hagen, where he does not state, of the occurrence of a member of the family on one of the Orthoptera; and although this must be considered of doubtful authenticity, it seems more than probable that others of the insect orders, especially the Hymenoptera, may prove to be similarly parasitized. It will be noticed in the appended host index that coleopterous hosts outnumber very greatly all others; yet it should be borne in mind that this predominance of beetles in the list may be due in part to the fact that no other group has been examined with any care in this connection. The known occurrence of species on such diverse insects as the delicate fly Drosophila, the larva of a white ant, and the acarid Antennophorus, certainly suggests many possibilities as to the types of hosts likely to be affected. There seems no good reason, then, why a much greater variety of insects than are at present known should not be added to the list, especially from the tropics, provided that they fulfil the apparent requirement of overlapping generations and moderate longevity, coupled with a cleanly and not too solitary habit.

The relative numbers infesting the various orders and families of insects may be seen at a glance from the following table, which includes all forms known to the writer, whether described or otherwise, and is approximately correct, though not absolutely so, in so far as regards the number of the undetermined species of hosts.

Table of Host Insects of Laboulbeniaceæ.

Total number of species of insects known to become the hosts of members of the Laboulbeniaceæ	250
Total number of genera represented by these hosts	86
Total number of hosts belonging to the order Coleoptera	241

Total numbers of hosts in the different families of this order: —

Carabidæ	genera 47;	species, 156
Haliplidæ	" 2;	" 2
Dytiscidæ	" 3;	" 8
Gyrinidæ	" 3;	" 15
Hydrophilidæ	" 4;	" 9
Staphylinidæ	" 18;	" 50
Coccinellidæ	" 1;	" 1

Total number of hosts belonging to the order Diptera	6

Total numbers of hosts in the different families of this order: —			
Nycteribidæ	genera, 3;	species, 3	
Diopsidæ	" 1;	" 1	
Drosophilidæ	" 1;	" 2	
Muscidæ	" 1;	" 1	
Total number of hosts belonging to the order Neuroptera			1
A single family Termites	genus, 1;	species, 1	
Total number of hosts belonging to the order Arachnida			1
A single family Gasmidæ	genus, 1;	species, 1	

In comparing the species and genera represented by these hosts it is noticeable that although the Carabidæ exceed all other families as regards the number of genera and of species, both of hosts and parasites, the number of genera by which they are infested is comparatively small. Of the seventy-five species of Laboulbeniaceæ which are found on members of this family, sixty-five belong to the single genus Laboulbenia, while the remaining ten are distributed among but five genera, Dimeromyces, Peyritschiella, Enarthromyces, and Rhachomyces. In the case of the Staphylinidæ, however, which, next to the Carabidæ, includes more hosts than any other family, the proportions in this respect are quite different. For although the genus Laboulbenia predominates to such a degree in the Carabidæ and infests all of the orders, and a majority of the families given in the above table; among the fifty species known on members of the Staphylinidæ, but four belong to this genus, while the remaining forty-two are distributed among no less than eighteen genera. The last mentioned family is thus by far the most interesting in this connection, and its parasites abound in peculiar forms.

It is further observable that the aquatic hosts, with the exception of the Gyrinidæ, the species of which swim on the surface of the water and carry their ~~hosts~~ parasites at least partly exposed to the air during much of their existence, are infested only by members of the three genera Zodiomyces, Ceratomyces, Hydraeomyces, and Chitonomyces, of which the two first mentioned are the only representatives of the group of "exogenæ," producing their antherozoids exogenously.

In general, it is true that among the Coleoptera infested a majority are either riparian or aquatic in their habits; yet there are a number of forms that occur upon insects which live away from the water and often inhabit rather dry situations. Of these, Chilocorus is perhaps the best example; while, outside the Coleoptera, the common house-fly affords a conspicuous instance of a host very subject to this parasitism, yet far from riparian in its habit. Peyritsch notes the fact that, in his experience, hosts inhabiting the margins of running water were much more likely to be parasitized than those found along the borders of ponds or of still water generally; but this has certainly not been my own experience, and the margins of ponds or of boggy places generally have always proved as rich in Laboulbeniaceæ as those of brooks or rivers. It is also worthy of note that the statement made by the same author that iridescent hosts are not infected has not proved to be true in my experience.

The relation of the parasite to its host as regards its nutrition has already been referred to, and there can be no doubt that the fluids of the insect are absorbed by osmosis through the membrane of the foot or haustorium, whether this be a highly developed penetrating organ, as in Rhizomyces or Moschomyces, or consists merely in a sucker-like external attachment.

The relation of the parasite to its host, in position, is a matter of interest for several reasons; for, although all parts of the latter may be infested, the antennæ, the eyes, the mouth parts, the anal plates, — in fact any portion exposed when the insect is at rest, — certain species exhibit a very remarkable definiteness in regard to their point of attachment. In some forms, like *Laboulbenia Nebriæ*, or *L. Galeritæ*, the parasite occurs indiscriminately all over the host; others, like *L. terminalis*, *L. fumosa*, or *L. luxurians*, only at the tips of the elytra and the adjacent region about the extremity of the abdomen. Others, like *L. parvula* and *L. arcuata*, have been found only on the legs, the latter species always in a definite position. *L. Harpali*, again, occurs on one side only, along the anterior inferior margin of the thorax and the adjacent margin of the prothorax. *L. contorta*, *L. umbonata*, *L. elegans*, *L. lepida* and *L. texana* all occur, with very rare exceptions, on the prothorax just below the external margin, usually on a definite side; and it may be noted in passing that, especially as regards the extremity of the perithecium, all the last-mentioned species have a family resemblance. Instances like those just enumerated might be multiplied; but by far the most remarkable examples occur in the genus Chitonomyces. Species of this genus growing, for example, on *Laccophilus maculosus*, can be distinguished, as a rule, with certainty merely by noting their relative positions. *C. parodoxus* is invariably fixed to the margin of the left elytron about half-way between its base and apex; *C. marginatus* occurs just within the margin of the same elytron nearer the apex. *C. lichanophorus* is found only on one of the inferior median anal plates (always the same plate), and so on through the list of twelve species that infest this host; the only instance which I have noticed of any deviation in their position being in the case of *C. marginatus*, which is rarely found attached to the left posterior leg.

Why such constancy in position should exist in some cases, and not in others, is a matter that I am wholly unable to explain. It is certainly not connected in any way with matters of nutrition, and although it may be in part explained as resulting from the fact that the spores are transferred while the sexes are *in coitu,* and the points of infection are determined by definitely recurring motions of the legs or otherwise, this does not seem sufficient to explain the constancy of the phenomenon. Peyritsch (1875), calls attention to the fact that *Stigmatomyces Baeri* invariably occurs on the under surface of the male and on the upper surface of the female host. Such a fact, if it were true, would readily be explained in this way. My own observations, however, do not agree with those of Peyritsch in this respect, though this relative position may perhaps be the more common.

That certain types of form are associated with certain types of hosts seems to be a fact illustrated in a limited number of instances, — a well-marked case being afforded by the species of Laboulbenia which are found on Clivina and its near allies, and those which occur on Galerita and related forms. The species of Laboulbenia which inhabit water beetles also furnish a case in point.

Parasites of Laboulbeniaceæ. In examining a very large amount of material I have been struck by the general absence of parasites attacking these fungi. A very small number of such parasites do, however, occur, the most striking of which belong to two forms of an apparently new genus of the Chytridineæ, which grow externally on species of Ceratomyces, possessing well-developed filaments and large appendiculate zoosporangia. The only other parasite which seems at all peculiar to the order is a minute organism, perhaps a yeast, that often completely envelopes the appendages, especially of species of Laboulbenia, assuming a characteristic semi-lunar form. The same organism sometimes makes its way into the interior of the perithecium, filling it and destroying its contents.

Parasites associated with the Laboulbeniaceæ, and, like them, attached to living insects, are more or less abundant; and while the majority are animal in nature (bell animalcules, rotifers, etc.), there is one genus of fungi (?), unknown to me, which, though quite colorless, resembles some of the more simple chlorozoosporic algæ. It is attached to the insect (and sometimes by accident to specimens of the Laboulbeniaceæ) by a slightly blackened base, and consists of about three superposed cells, the upper of which produces a small number of apparently non-motile spores endogenously, that escape through a terminal opening.

The genus described as Devoea,[1] which is evidently not in any way "related to the Saprolegniæ," but seems to be an encysted condition of some protozoan or other animal organism, is also not infrequently found on water beetles.

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[1] Lockwood, S. Fungi affecting fishes. Jour. N. Y. Microscop. Soc. Vol. VI., p. 67 (1890).

The collection of Laboulbeniaceæ involves little more than the collection of a sufficient number of the proper hosts, although their presence on the latter is not always easy to ascertain in case of the smaller forms. In so far as concerns the collection of hosts, my own experience, which is not that of a skilled entomologist, much less of a coleopterist, indicates that the most favorable localities in which to search for infested beetles is along the margins of small streams or of ponds. In such situations abundance of hosts may usually be found under stones or sticks, or in rubbish, that may be best shaken over a sheet or other white cloth, on which the insects are readily captured. Traps deposited in such situations, and made by raking together a heap of decaying grass, algæ, etc., often yield large numbers of interesting specimens when examined in this way. Many forms may also be obtained by leaving bundles of hay or grass in cultivated ground for a few days and examining them over a sheet. Water beetles are in general best obtained by sweeping the margins of ponds or ditches with a dip net; those bearing Zodiomyces ,occurring in cool gravel along the margins of brooks, or in cold, wet rubbish which has accumulated on rocks or branches in its bed. Staphylinidæ which are either mycophagous or fimicolous have not been found to yield any parasites. Forms of this family most likely to be infested are best obtained by using the two kinds of traps above mentioned. The collection of hibernating specimens by "sifting" seldom yield parasites in good condition. A few hosts may be obtained on flowers: *Harpalus pennsylvanicus,* for example, which is very commonly infested, is usually found in abundance climbing up the spikes of *Ambrosia artemisiæfolia* about dusk.

Laboulbeniaceæ may be "cultivated" in the manner above alluded to, by confining infested hosts with such as are free from any parasites; and this is not a matter of any considerable difficulty, provided that surroundings are furnished which are suited to the habits of the insects employed. If pains are taken to keep these surroundings moist and fresh, the parasites will develop normally; but if there is not sufficient moisture to allow of a certain amount of condensation on the surface of the hosts, fertilization is apt to be interfered with, and, as a result, one finds a large number of abnormal and undeveloped forms. As a rule, it is more satisfactory and quite as little trouble to obtain specimens that have grown under natural conditions, and little, if any, advantage is to be obtained from such artificial cultivation.

No attempt has been made to cultivate the spores in artificial nutrient media, and the results which might be looked for from such cultures, even if they should prove to be possible, which I very much doubt, are not likely to afford data which could not be as well or better observed by the examination of successive stages in individuals naturally developed; except, perhaps, in so far as concerns the possibilities of monstrous development which these plants might exhibit under such unnatural conditions.

Preparation of Material for Examination. Having obtained a number of hosts which are liable to be parasitized, it will found that from about five to fifty per cent. will bear parasites. In order to obtain them for examination, the host should be killed and impaled on a fine needle (a No. 12 sewing-needle mounted in a match is the most convenient), care being taken that the surface of the insect remains perfectly clean and dry, and then examined over a dull white, and then over a black surface with a hand lens magnifying about eight or ten diameters, a dissecting microscope being most conveniently used for this manipulation. Every portion of the insect should be examined in different positions, and when the parasites have been discovered, they should be removed by means of a dissecting needle like that just mentioned, the needle having been inserted in the match far enough to give it the requisite stiffness, while its apex should have been ground on a fine oil-stone until a sharp, slightly oblique chisel point has been obtained. With such a point, the individuals are scraped off without much difficulty, and should be transferred to a very small drop of water on the slide. When the desired number have been thus transferred, the individuals may be conveniently arranged by means of a fine hair mounted like the needles. The excess of water should then be drawn away from the specimens with a shred of blotting paper, and as soon as the moisture has dried around them, they should be quickly treated with alcohol, and covered with a cover glass which should always be supported by a shred of blotting paper or a chip of cover glass. The alcohol should then be replaced by water, as quickly as possible, when the individuals will be found still living, if the manipulations have been sufficiently rapid, and attached to the surface of the slide as a result of the slight drying just mentioned. Although these directions may seem superfluous, it will be found that if they are accurately followed, much trouble and the loss of many specimens will be avoided. For permanent mounting, I have used only glycerine, to which is best added a small amount of a saturated alcoholic solution of eosin, together with a trace of common salt. This preparation is very satisfactory for general purposes, and should be allowed to run under the cover glass and replace the water slowly, as it evaporates. If the replacement is too rapid, the individuals will become shrunken, but generally regain their normal form in a few days, or in a much shorter time.

Dried material for herbarium specimens, which is always sufficiently good for purposes of determination, should be mounted in tight pill-boxes on the herbarium sheet, to avoid the depredations of Anthrenus and other pests of insect collections. A little cotton in the box prevents the host, as well as its parasites, from being injured by falling about when moved. Care should also be taken that the insect is kept clean and free from dust particles or exudations from its own body. Otherwise, it is often difficult or indeed impossible to detect the parasites when needed for examination.

PART II.

NOTE CONCERNING THE SYSTEMATIC POSITION OF THE LABOULBENIACEÆ.

THE systematic position of the Laboulbeniaceæ has been a matter of much uncertainty, and even in the light of a fuller knowledge, both of the forms and of their development, it still remains undetermined what are their immediate connections within the group of Ascomycetes to which they must undoubtedly be referred. As we have seen, Montagne and Robin (1853), who were the first to describe them as plants, speak of the single genus then known as "e familia Pyrenomycetum novum genus," and compare it to Capnodium, although they made no observations on the origin of the spores. Later, Karsten, who first included them in the Mucorini (1869), places them (1895) in a group of "Stigmatomycetes," between the Ustilagineæ and the Pyrenomycetes; but although this author correctly observed the essential fact of the occurrence of fecundation, he denies the presence of asci, and gives a quite erroneous account of the spore formation. Peyritsch (1871, 1873), although his observations on the process of fecundation were incorrect, was the first to present any definite evidence of their ascomycetous nature; yet it seems doubtful whether asci were seen even by him, since his reference to them as "eight to twelve spored" indicates the correctness of the criticism made by Karsten, who held that these "asci" were merely the ordinary aggregations of spores, coherent in a fusiform mass, as is their wont, and surrounded by their own gelatinous envelopes, which were mistaken for the ascus wall. This element of uncertainty in the observations of Peyritsch led De Bary to place the group among his "Doubtful Ascomycetes," a disposition in which he has been followed by most systematists who have alluded to the group at all. In any case, it is at present definitely determined that asci, containing four or very rarely eight spores, always occur; and that they are beyond question the morphological equivalents of the corresponding structures in the Ascomycetes generally. It further seems undeniable that these bodies are of sexual origin, in view of the evidence adduced in the foregoing pages. If, then, we admit both the sexual and the ascomycetous nature of these plants, their consideration becomes a very important factor in any attempt to trace the homologies of the ascus or the derivation of the group of Ascomycetes in general.

It is not my intention in this connection to enter into any detailed discussion of the several theories which have been advanced in regard to these matters; yet they cannot be allowed to pass unnoticed. In brief, it may be said that, as regards the primary origin of the Ascomycetes, authorities seem generally agreed in deriving them, in an ascending series, from the Phycomycetes; but in the discussion of the homologies of the reproductive organs in either case, the agreement has not been so striking. De Bary, as is well known, relying in a great measure on his observations in regard to the development of Sphærotheca, as well as on the account given by Eidam of his genus Eremascus, finds little difficulty in homologizing (with his usual judicious cautiousness of statement) the asci of these genera with the oogonia of the Phycomycetes; while their sexual derivation was further substantiated through the studies of Janczewski and others on Ascobolus, by those of Kihlman and others on Pyronema, by those of Stahl on the Collemaceæ, as well as by further observations which need not be here enumerated. In later years there has been a reaction from this view, for the most part due to the very important, yet unconvincing, researches of Brefeld. This writer, by the accumulation of a large amount of wholly negative evidence, having discarded as without significance the positive evidence just referred to, presents an argument from which he concludes that although the Ascomycetes have originated from the Phycomycetes, they have lost all traces of sexual organs. According to this view, the ascus is assumed to be merely a modified non-sexual sporangium, homologous with the non-sexual sporangia of the Phycomycetes; and an attempt is made to substantiate this assumption by the citation of a series of examples which, in his opinion, illustrate the actual process of evolution by which this transformation has been brought about.

In still more recent years, observations made by Dangéard on the phenomena of nuclear fusion in the Ascomycetes and elsewhere, prior to spore formation, have led this writer to believe that oosporic sexuality, thus expressed, is general among the higher fungi, including the group in question; a view which, for reasons that need not here be considered, does not seem to call for serious consideration.

It is thus apparent that the question under discussion has resolved itself into the phyllogeny, not of the Ascomycetes, but of the ascus; one "school" asserting its non-sexual character, the other the reverse. Supporters of the former contention, like Van Tieghem, for example, seeing in the trichogyne of Stahl a remarkably developed "ventilating apparatus," or in the "carpogonium" of Ascobolus or Pyronema, a group of merely vegetative cells charged with nutriment destined for a special purpose. Others, again, believing that the organs described are sexually significant, consider them, in many cases, functional, while in others, they may have lost their sexual character or have disappeared entirely; the presence among the Ascomycetes of purely apogamic forms being as readily reconciled with the coexistence of sexual forms as it is among the Phycomycetes, where a similar degeneration to an apogamous condition is well known to exist in not a few instances.

Recent investigations, however, embodied in the very important paper on Sphærotheca lately published by Dr. Harper,[1] indicate that while De Bary, who may be considered the chief exponent of the view last mentioned, was correct in his general observation as to the existence of sexual reproduction in connection with the formation of the ascus in this plant, he was misled by his failure to observe the very significant phenomena exhibited by the changes which take place in the carpogenic cell after its fertilization. These phenomena, which consist in the production of a series of superposed cells only one of which, and that not the terminal one, enlarges or buds out to form the solitary ascus, forbid any such direct comparison as that suggested by De Bary, between this single ascus and the oogonium of the Phycomycetes. It seems not unlikely that further and more exact observations on Eremascus may lead to some similar modification of the course of development described by Eidam; and in any case, in view of the absence in one or in both of these instances of such evidence as they were thought by De Bary to afford in support of his own views, and the, to myself at least, wholly unconvincing character of the arguments and illustrations presented by Brefeld in support of his peculiar theories, one seems justified in suggesting at least the possibility of an origin for the Ascomycetes quite different from that assumed by either of these authorities. In my own opinion, the comparison made by Harper, in the paper cited, between the sexual process therein described and that of Nemalion, though it might seem at first sight hardly warrantable, becomes distinctly justified when one places between these two instances that of the present group.

If, on the one hand, we compare the Laboulbeniaceæ with the Florideæ, a very distinct agreement is apparent between them as regards their mode of growth and general structure; while this comparison is also suggested by the gelatinous envelope and the conspicuously developed continuity of the protoplasm between adjacent cells within it. The development of the perithecia in the one case finds a parallel in that of certain cystocarps, and the type of sexual reproduction in either group is essentially identical.

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[1] Ber. d. Deutsch. Bot. Gesell., Vol. XIII, p. 475 (1895).

If, on the other hand, the group is compared with the ascomycetous fungi, one finds that the differences in general structure are apparent and not real, the vegetative body consisting of a septate filament which elongates and branches in a definite fashion within a general enveloping membrane. The thallus is thus not essentially different in the two cases, and the perithecium of the Laboulbeniaceæ is exactly comparable to the corresponding structure in other Ascomycetes, like Sphærotheca for example; the process of formation in either case involving the enclosure of a female cell, through the upgrowth around it of filaments originating below its base. It is further unquestionably true that its sexual organs and sexual reproduction are strictly homologous with the corresponding structures and phenomena that have been described in the Collemaceæ, in Ascobolus, in Sphærotheca, and in other instances. Lastly, the products resulting from this sexual process, the asci and ascospores, are identical and homologous with those similarly resulting in the cases mentioned.

That the Laboulbeniaceæ greatly resemble the Florideæ may then be inferred from the general structure of its members, its sexual phenomena, and the development of its sporocarps and asci, resemblances which, it may be added, are coupled with an aquatic or sub-aquatic habit. That it belongs not among the algæ, but among the fungi, is indicated by the absence of chlorophyl and of true cellulose in its cells, coupled with a parasitic habit; while the products of its sexual reproduction, the asci and ascospores, are those of fungi and by no means of algæ.

In view of these facts the derivation of the Ascomycetes through the Laboulbeniaceæ from some branch of the Florideæ seems a supposition not unworthy consideration, and although personally I regard such a suggestion as a mere speculation, I must confess that if one must have a theory of derivation in this case on a basis of ascertained facts, an origin of the nature above indicated is in my own opinion more probable as well as more logical than that which is usually held: since the latter involves the, to my mind, improbable assumption that a parasitically degraded series has attained, by a parallel course of upward development, the same goal which has been reached by the carposporic algæ; the alternative, on the other hand, involving the consideration of the fungi as a heterogeneous group derived through degeneration at different points from types already elaborated in the algal series.

Speculations of this nature are, however, of little value in the absence of facts by which they may be substantiated; yet if the origin of the family from the Florideæ is, to say the least, problematical, it is almost equally a matter of conjecture if one attempts to determine their exact point of union with the Ascomycetes in general. While their color, gelatinous consistency, and entomogenous habit might suggest a remote relationship to the Hypocreaceæ, it is worthy of note that the bodies most nearly resembling the characteristic antheridial cells found in the family are the "Hyphopodies mucronées" of the Meliolæ; but having as yet been unable to examine the latter in a fresh condition, I can at present merely suggest the possibility of a similarity of function.

In arranging the genera under which are grouped the species included in the following systematic enumeration, the primary divisions have been based on the characters of the male sexual organs. Forms having antherozoids exogenously produced, have been separated in a group of "exogenæ," comprising but two genera, while the remaining twenty-six genera having antherozoids that are produced endogenously, are placed in a second group of "endogenæ."

The two genera of the first-mentioned group are both primarily aquatic, and if we entertain the suggestion that the family has been derived from carposporic algal ancestors, might, from their simple antheridial branches and their aquatic habit, be considered as probably the more primitive of the two groups. Of this group, the genus Ceratomyces may be taken as the type, since it illustrates most clearly not only the exogenous formation of antherozoids, but the indeterminate development of the perithecia and their tendency towards an appendiculate condition.

The twenty-four genera of the second group offer many difficulties, if one attempts to arrange them in lineal sequence; but here again the character of the male sexual organs affords a natural means for their general separation into two groups, characterized in the one case by the presence of what have been previously described as "compound," in the other of "simple" antheridia, and these again may be subdivided according as the sexual organs occur on the same or on different individuals.

A further subdivision has been employed in the following synopsis based upon the determinate or indeterminate arrangement of the antheridial cells; but this disposition, while it expresses, in a measure, true relationships, by bringing together such genera as Idiomyces, Stigmatomyces, and Helminthophana, is not wholly satisfactory. Further than this, a definite arrangement into not too numerous sub-groups is hardly possible, although it is evident that genera like Moschomyces, Compsomyces, and perhaps Sphaleromyces, or Teratomyces and Diplomyces should go together. A more definite appreciation of their further relationships will no doubt become possible after the discovery of additional genera; but at present it would be quite superfluous to attempt to represent them graphically.

GENERAL SYNOPSIS OF THE GENERA AND SPECIES WITH THEIR HOSTS.

FAMILY LABOULBENIACEÆ.

GROUP I. Endogenæ. Antherozoids produced endogenously.

ORDER I. PEYRITSCHIELLEÆ. Antheridial cells united to form a compound antheridium.

A. Diœcious.

GENUS I. DIMORPHOMYCES. Perithecia and appendages borne in pairs to the right and left of the median line.

(1) **D. denticulatus** Thaxter, on *Falagria dissecta* Er., N. America.

(2) **D. muticus** Thaxter, on *Falagria dissecta* Er., N. America.

GENUS II. DIMEROMYCES. Perithecia and appendages in a unilateral series.

(1) **D. africanus** Thaxter, on *Pachyteles luteus Hope*, Africa.

B. Monœcious.

* Antheridium borne on an appendage free from the receptacle.

GENUS III. CANTHAROMYCES. Antheridium lateral below a terminal branch of the appendage. Perithecia free.

(1) **C. Bledii** Thaxter, on *Bledius assimilis,* N. America.

(2) **C. occidentalis** Thaxter, on *Bledius armatus* Er., N. America.

(3) **C. pusillus** Thaxter, on *Trogophlœus* sp., N. America.

GENUS IV. HAPLOMYCES. Antheridium terminal tipped by a spine-like process. Perithecia free.

(1) **H. californicus** Thaxter, on *Bledius ornatus* Lec., N. America.

(2) **H. texanus** Thaxter, on *Bledius rubiginosus* Er., N. America.

(3) **H. virginianus** Thaxter, on *Bledius emarginatus* Say, N. America.

GENUS V. EUCANTHAROMYCES. Antheridia terminal with a neck-like terminal canal, the antheridial cells in five (?) vertical series. Perithecia free.

(1) **E. Atrani** Thaxter, on *Atranus pubescens* Dej., N. America.

GENUS VI. CAMPTOMYCES. Antheridium terminal with a prominent apical pore. Antheridial cells in two (?) vertical series. Perithecia free.

(1) **C. melanopus** Thaxter, on *Sunius prolixus* Er., *S. longiusculus* Mann., N. America.

** Antheridium sessile on the body of the receptacle, sharply pointed.

GENUS VII. ENARTHROMYCES. Receptacle a single series of superposed cells with one or more lateral antheridia. Perithecia free.

(1) **E. indicus** Thaxter, on *Pheropsophus* sp., Asia.

Genus VIII. Peyritschiella. Asymmetrical receptacle consisting of several superposed transverse series of cells above its one or two basal cells; antheridium single, lateral. Perithecia free.

(1) **P. curvata** Thaxter, on *Platynus cincticollis* Say, N. America.
(2) **P. minima** Thaxter, on *Platynus cincticollis* Say, N. America.
(3) **P. geminata** Thaxter, on *Pterostichus luctuosus* Dej., *P. patruelis* Dej., *P. erythropus* Dej., N. America.
(4) **P. nigrescens** Thaxter, on *Philonthus debilis* Grav., N. America.

Genus IX. Dichomyces. Symmetrical receptacle of several superposed transverse series of cells, the basal cell single; a pair of antheridia on the subterminal series. Perithecia free.

(1) **D. furciferus** Thaxter, on *Philonthus debilis* Grav., N. America.
(2) **D. inæqualis** Thaxter, on *Philonthus debilis* Grav., N. America.
(3) **D. infectus** Thaxter, on *Xantholinus obsidianus* Melsh., N. America.
(4) **D. princeps** Thaxter, on *Philonthus sordidus* Grav., N. America.

Genus X. Hydræomyces. Receptacle asymmetrical, its distal portion united to the perithecium; its three basal cells superposed. Aquatic.

(1) **H. Halipli** Thaxter, on *Haliplus ruficollis* De G., *Cnemidotus muticus* Lec., N. America.

Genus XI. Chitonomyces. Receptacle asymmetrical, its distal portion united to the perithecium; its two basal cells superposed. Aquatic.

(1) **C. paradoxus** (Peyritsch), on *Laccophilus maculosus* Germ., *Laccophilus* sp. indet., N. America; *L. hyalinus* Dej., *L. minutus* Sturm., Europe.
(2) **C. appendiculatus** Thaxter, on *Laccophilus maculosus* Germ., N. America.
(3) **C. distortus** Thaxter, on *Laccophilus maculosus* Germ., N. America.
(4) **C. spinigerus** Thaxter, on *Laccophilus maculosus* Germ., N. America.
(5) **C. uncigerus** Thaxter, on *Laccophilus maculosus* Germ., N. America.
(6) **C. melanurus** Peyritsch, on *Laccophilus hyalinus* Dej., *L. minutus* Sturm, Europe.
(7) **C. marginatus** Thaxter, on *Laccophilus maculosus* Germ., *Laccophilus* sp. indet., *Hydroporus spurius* Lec., N. America.
(8) **C. rhyncostoma** Thaxter, on *Hydroporus spurius* Lec., *Laccophilus maculosus* Germ., N. America.
(9) **C. lichanophorus** Thaxter, on *Laccophilus maculosus* Germ., N. America.
(10) **C. uncinatus** Thaxter, on *Laccophilus maculosus* Germ., *Hydroporus spurius* Lec., N. America.
(11) **C. affinis** Thaxter, on *Laccophilus maculosus* Germ., *Hydroporus* sp., N. America.
(12) **C. hyalinus** Thaxter, on *Laccophilus maculosus* Germ., N. America.
(13) **C. simplex** Thaxter, on *Laccophilus maculosus* Germ., *Hydroporus spurius* Lec., and sp. indet., N. America.
(14) **C. Bidessarius** Thaxter, on *Bidessus granarius* Aube, N. America.
(15) **C. borealis** Thaxter, on *Desmopachria convexa* Aube, N. America.
(16) **C. aurantiacus** Thaxter, on *Desmopachria convexa* Aube, N. America.

ORDER II. Laboulbenieæ. Antheridial cells distinct, discharging independently.

A. Diœcious.

GENUS I. AMORPHOMYCES.

(1) **A. Falagriæ** Thaxter, on *Falagria dissecta* Er., N. America.

(2) **A. floridanus** Thaxter (species pro tem.) on *Bledius basalis* Lec., N. America.

B. Monœcious.

* Antheridia borne in definite series on the appendages.

x. Antheridia springing directly from successive cells of the appendage.

GENUS II. HELMINTHOPHANA. Appendage solitary, bearing the antheridia in four vertical series.

(1) **H. Nycteribiæ** Peyritsch, on *Megistopoda Westwoodii* Kolen., *Acrocholidia Montaguei* Kolen., and *Nycteribia Dufourii*, Europe.

GENUS III. STIGMATOMYCES. Appendage solitary, bearing the antheridia in a single vertical series.

(1) **S. entomophila** (Peck), on *Drosophila nigricornis* Loew., N. America, *Drosophila funebris* L., Europe.

(2) **S. Baeri** Peyritsch, on *Musca domestica* L., Europe.

(3) **S. virescens** Thaxter, on *Chilocorus bivulnerus* Muls., N. America.

GENUS IV. IDIOMYCES. Appendages numerous, bearing the antheridia in three vertical series.

(1) **I. Peyritschii** Thaxter, on *Deleaster dichrous* Grav., Europe.

xx. Antheridia borne on branches of the appendages.

GENUS V. CORETHROMYCES. Appendages forming a tuft, the antheridial cells superposed and forming lateral branchlets.

(1) **C. Cryptobii** Thaxter, on *Cryptobium pallipes* Grav., *C. bicolor* Grav., N. America.

(2) **C. setigerus** Thaxter, on *Lathrobium nitidulum* Lec., N. America.

(3) **C. jacobinus** Thaxter, on *Lathrobium jacobinum* Lec., and *L. collare* Er.

GENUS VI. RHADINOMYCES. Appendage single with terminal sterile branchlets; antheridia superposed in short series forming branchlets near its base.

(1) **R. cristatus** Thaxter, on *Lathrobium nitidulum* Lec., *L. punctulatum* Lec., N. America.

(2) **R. pallidus** Thaxter, on *Lathrobium fulvipenne* Grav., *L. punctulatum* Lec., *L. angulare* Lec., N. America.

** Antheridia not arranged in definite series on the appendages.

GENUS VII. RHIZOMYCES. Basal cell of the receptacle penetrating the host by rhizoidal outgrowths; sub-basal cell giving rise to a single simple appendage bearing unilaterally a single series of branches, the basal cells of which bear antheridia.

(1) **R. ctenophorus** Thaxter, on *Diopsis thoracica* Westw., Africa.

GENUS VIII. LABOULBENIA. Multicellular receptacle formed in part by the union of the base of the appendage and the stalk-cells of the perithecium. Appendages arising beside the perithecium usually from a black insertion cell.

(1) **L. anceps** Peyritsch, on *Platynus viduus* Pz., Europe.

(2) **L. arcuata** Thaxter, on *Harpalus pennsylvanicus* De G., N. America.

(3) **L. armillaris** Berlese, on *Antennophorus caput-carabis*, S. America.

(4) **L. Aspidoglossæ** Thaxter, on *Aspidoglossa subangulata* Chaud., N. America.
(5) **L. australiensis** Thaxter, on *Acrogenys hirsuta* Maclean, Australia.
(6) **L. Brachini** Thaxter, on *Brachinus mexicanus* Dej. and spp. indet., N. America.
(7) **L. brachiata** Thaxter, on *Patrobus longicornis* Say, *P. tenuis* Say, N. America.
(8) **L. Casnoniæ** Thaxter, on *Casnonia pennsylvanica* Linn., N. America.
(9) **L. Catascopi** Thaxter, on *Catascopus guatemalensis* Bates, N. America; *Catascopsus* two spp., Africa.
(10) **L. Clivinæ** Thaxter, on *Clivina dentifemorata* Putz., *C. dentipes* Dej., N. America.
(11) **L. compacta** Thaxter, on *Bembidium* spp. indet., N. America.
(12) **L. compressa** Thaxter, on *Anisodactylus baltimorensis* Say, N. America.
(13) **L. conferta** Thaxter, on *Harpalus pennsylvanicus* De G., N. America.
(14) **L. confusa** Thaxter, on *Bembidium* sp. indet., N. America.
(15) **L. contorta** Thaxter, on *Platynus extensicollis* Say, *P. affinis* Kirby, N. America.
(16) **L. cornuta** Thaxter, on *Bembidium complanulum* Mann., N. America.
(17) **L. Coptoderæ** Thaxter, on *Coptodera Championi*, Bates, N. America.
(18) **L. cristata** Thaxter, on *Pæderus littorarius* Grav., *P. obliteratus* Lec., *Pæderus* sp. indet., N. America; *P. ruficollis* Fabr., Europe.
(19) **L. curtipes** Thaxter, on *Bembidium bimaculatum* Kirby, N. America.
(20) **L. decipiens** Thaxter, on *Galerita nigra* Chev., *G. æquinoctialis* Chaud., N. America.
(21) **L. Diopsis** Thaxter, on *Diopsis thoracica* Westw., Africa.
(22) **L. elegans** Thaxter, on *Harpalus pennsylvanicus* De G., N. America.
(23) **L. elongata** Thaxter, on *Platynus cincticollis* Say, *P. extensicollis* Say, *P. melanarius* Dej., *P. ruficornis* Lec., *P. picticornis* Newm., *P. bicolor* Lec., *P. pusillus* Lec., *P. dissectus* Lec., *P. brunneomarginatus* Mann., *P. floridanus* Lec., *P. sinuatus* Dej., *P. ovipennis* Mann., *Anisodactylus baltimorensis* Say, *Colpodes purpuripennis* Chaud., *C. cœruleomarginatus* Chaud., *C. duplex* Bates, *C. grata* Bates, *C. petilis* Bates, *C. incultus* Bates, *C. sphodroides* Chaud., *C. cyanonotus* Chaud., *C. tenuicornis* Chaud., N. America. *Platynus ruficornis* Gœze, *Læmosthenes* (*Pristonychus*) *cavicola* Sch. Europe, *Platynus* sp., Asia (Japan), *Colpodes* sp., S. America, *Macrochilus biguttatus* Gœze, Africa.
(24) **L. europæa** Thaxter, on *Chlænius æneocephalus* Dej., *C. chrysocephalus* Rossi, *Callistus lunatus* Fabr., *Aptinus mutilatus* Fabr., *Brachinus explodens* Duft., Europe.
(25) **L. fasciculata** Peyritsch, on *Chlœnius vestitus* F., *Omophron limbatum*, F., Europe.
(26) **L. filifera** Thaxter, on *Anisodactylus Harrisii* Lec., *A. nigerrimus* Dej., *A. interpunctatus* Kirby, *Anisodactylus* spp. indet., *Harpalus erythropus* Dej., *H. pleuriticus* Kirby, N. America.
(27) **L. flagellata** Peyritsch, on *Bembidium lunatum* Duft., Europe.
(28) **L. fumosa** Thaxter, on *Platynus cincticollis* Say, N. America.
(29) **L. Galeritæ** Thaxter, on *Galerita Janus* Fabr., *G. mexicana* Dej., *G. atripes* Lec., *Galerita* sp. indet., N. America.
(30) **L. gibberosa** Thaxter, on *Platynus extensicollis* Say, N. America.
(31) **L. Guerinii** Mont. et Robin, on *Gyretes sericeus* Lab., S. America; *G. compressus* Lec., N. America.

(32) L. **Gyrinidarum** Thaxter, on *Gyrinus fraternus* Coup., *G. affinis* Aub., *G. ventralis* Kirby, *G. analis* Say, *G. confinis* Lec., *G. consobrinus* Lec., *G. plicifer* Lec., *Gyrinus* spp. indet., N. America; *G. urinator* Illig., Europe.

(33) L. **Hageni** Thaxter, on *Termes mozambica* Hagen, Africa.

(34) L. **Harpali** Thaxter, on *Harpalus pennsylvanicus* De G., N. America.

(35) L. **inflata** Thaxter, on *Bradycellus rupestris* Say, N. America.

(36) L. **Kunkelii** Giard, on *Mormolyce phyllodes* Hagenb., Asia (Java).

(37) L. **lepida** Thaxter, on *Anisodactylus nigerrimus* Dej., N. America.

(38) L. **longicollis** Thaxter, on *Galerita leptodera* Chaud., *Galerita* sp. indet., Africa.

(39) L. **luxurians** Peyritsch, on *Bembidium* spp. indet., N. America, *Bembidium varium* Oliv., *B. bipunctatum* Duft., *B. flammulatum* Clairv., Europe.

(40) L. **macrotheca** Thaxter, on *Anisodactylus baltimorensis* Say, *Anisodactylus* sp. indet., N. America.

(41) L. **melanotheca** Thaxter, on *Galerita mexicana* Chaud., N. America.

(42) L. **mexicana** Thaxter, on *Galerita mexicana* Chaud., *G. nigra* Chev., *G. æquinoctialis* Chaud., N. America.

(43) L. **minima** Thaxter, on *Callida pallidipennis* Chaud., N. America.

(44) L. **Morionis** Thaxter, on *Morio Georgii* Pal., N. America.

(45) L. **Nebriæ** Peyritsch, on *Nebria pallipes* Say, *N. Sahlbergi* Fisch, *N. gregaria* Fisch, N. America; *N. brunnea* Duft., *N. villæ* Dej., Europe.

(46) L. **Oberthuri** Giard, on *Orectogyros heros* Reg., Madagascar.

(47) L. **Orectogyri** Thaxter, on *Orectogyros Bedeli* Reg., Africa.

(48) L. **Pachytelis** Thaxter, on *Pachyteles mexicanus* Chaud., N. America.

(49) L. **palmella** Thaxter, on *Mormolyce phyllodes* Hagenb., Asia (Java).

(50) L. **Panagæi** Thaxter, on *Panagæus crucigerus* Say, *P. fasciatus* Say, N. America.

(51) L. **parvula** Thaxter, on *Platynus extensicollis* Say, *P. æruginosus* Dej., *Platynus* spp. indet., N. America.

(52) L. **paupercula** Thaxter, on *Platynus melanarius* Dej., *P. ruficornis* Lec., *P. extensicollis* Say, N. America.

(53) L. **pedicillata** Thaxter, on *Bembidium* spp. indet., N. America.

(54) L. **perpendicularis** Thaxter, on *Bembidium* spp. indet., N. America.

(55) L. **Pheropsophi** Thaxter, on *Pheropsophus æquinoctialis* Linn., *Pheropsophus* spp. indet., S. America; *Pheropsophus marginatus* Dej. (?), *Pheropsophus* sp. indet., Africa.

(56) L. **Philonthi** Thaxter, on *Philonthus debilis* Grav., *P. cunctans* Horn, *P. micans* Grav., *P. æqualis* Horn, *P. furvus* Nord, *Philonthus* spp. indet., N. America.

(57) L. **polyphaga** Thaxter, on *Olisthopus parmatus* Say, *Stenolophus limbalis* Lec., *S. fuliginosus* Dej., *Badister maculatus* Lec., *Harpalus pleuriticus* Kirby, *Agonoderus pallipes* Fabr., *Loxandrus* several spp. (?), N. America; gen. indet., S. America (?); on *Amara* sp., Africa.

(58) L. **proliferans** Thaxter, on *Eudema tropicum* Hope, *Eudema* sp. indet., *Chlænius tenuicollis* Fabr., *C. velutinus* Duft., Africa; *Dolichus* sp. (?), Asia (Japan).

(59) L. **Pterostichi** Thaxter, on *Pterostichus adoxus* Say, *P. luctuosus* Dej., *P. mancus* Lec., *P. relictus* Newm., *Anisodactylus nigerrimus* Dej., N. America.

(60) **L. Quedii** Thaxter, on *Quedius vernix* Lec., N. America.

(61) **L. recta** Thaxter, on *Platynus extensicollis* Say, N. America.

(62) **L. rigida** Thaxter, on *Pterostichus patruelis* Dej., N. America.

(63) **L. Rougetii** Mont. et Robin, on *Brachinus crepitans* L., *B. explodens* Duft., *B. scolopeta* Fabr., Europe.

(64) **L. scelophila** Thaxter, on *Platynus extensicollis* Say, N. America.

(65) **L. Schizogenii** Thaxter, on *Schizogenius lineolatus* Say, *S. ferrugineus* Putz., *Clivina cordata* Putz., N. America.

(66) **L. subterranea** Thaxter, on *Anophthalmus Menetriesii* Motsch, *A. pusio* Horn, N. America; *A. Motschulskyi* Schm., Europe.

(67) **L. terminalis** Thaxter, on *Pterostichus luctuosus* Dej., N. America.

(68) **L. texana** Thaxter, on *Brachinus* spp. indet., N. America.

(69) **L. truncata** Thaxter, on *Bembidium* sp. indet., N. America.

(70) **L. umbonata** Thaxter, on *Stenolophus ochropezus* Say, N. America.

(71) **L. variabilis** Thaxter, on *Anomoglossus pusillus* Say, *Chlænius æstivus* Say, *C. cumatilis* Lec., *C. cursor* Chev., *C. leucoscelis* Chaud., *C. floridanus* Horn, *C. pennsylvanicus* Say, *C. ruficaudis* Chaud., *C. sparsus* Lec., *C. texanus* Horn, *C. tricolor* Dej., *C. viridicollis* Reiche, *Omophron americanum* Dej., *Omophron* spp. indet., *Patrobus longicornis* Say, *Platynus extensicollis* Say, *Pterostichus adoxus* Say, *P. luctuosus* Dej., *P. corvinus* Dej., *P. caudicalis* Say, *P. Sayi* Brullé, *Nebria pallipes* Say, *Blethisa multipunctata* Fabr., *B. quadricollis* Bald., N. America; *Pterostichus* (?) sp., S. America.

(72) **L. vulgaris** Peyritsch, on *Bembidium mexicanum* Dej., *B. lævigatum* Say, and many spp. indet., *Trechus chalybeus* Mann., N. America; *Bembidium littorale* Pz., *B. fasciolatum* Duft., *B. punctulatum* Drap., *B. lunatum* Duft., *B. obsoletum* Dej., *B. Andreæ* Sch., *B. flammulatum* Clairv., *B. decorum* Pz., *B. femoratum* Sturm., *B. bipunctatum* Duft., Europe; on gen. indet., Asia (?).

(73) **L. zanzibarina** Thaxter, on *Crepidogaster bimaculata* Boh., Africa.

GENUS IX. TERATOMYCES. Receptacle of three superposed cells above which a series of smaller cells arranged in a transverse series give rise to numerous appendages which completely surround the bases of the (one or more) perithecia.

(1) **T. mirificus** Thaxter, on *Acylophorus pronus* Er., N. America.

(2) **T. Quedianus** Thaxter, on *Quedius ferox* Lec., N. America.

(3) **T. brevicaulis** Thaxter, on *Actobius nanus* Horn, N. America.

(4) **T. Actobii** Thaxter, on *Actobius nanus* Horn, N. America.

GENUS X. DIPLOMYCES. Receptacle symmetrical with paired posterior projections, the appendages and perithecia also paired.

(1) **D. Actobianus** Thaxter, on *Actobius nanus* Horn, N. America.

GENUS XI. RHACHOMYCES. Receptacle consisting of a main axis of superposed cells from which on one side smaller appendiculate cells are separated, the perithecia sub-terminal.

(1) **R. speluncalis** Thaxter, on *Anophthalmus pusio* Horn, N. America.

(2) **R. lasiophorus** Thaxter, on *Atranus pubescens* Dej., *Badister micans* Lec., *Acupalpus carus* Lec., and gen indet., N. America.

(3) **R. arbusculus** Thaxter, on gen. indet., near Lathrobium, Africa.

(4) **R. longissimus** Thaxter, on *Colpodes evanescens* Bates, N. America.

(5) **R. furcatus** Thaxter, on *Othius fulvipennis* Fabr., Europe.

(6) **R. hypogæus** Thaxter, on *Anophthalmus Bilimeki* Sturm., Europe.

(7) **R. Lathrobii** Thaxter, on *Lathrobium longiusculum* Grav., *Lathrobium* sp. indet., N. America.

(8) **R. pilosellus** (Robin), on *Lathrobium fulvipenne* Grav., Europe.

GENUS XII. CHÆTOMYCES. Receptacle a simple series of superposed cells, the appendages and perithecium forming a single vertical series.

(1) **C. Pinophili** Thaxter, on *Pinophilus latipes* Er., N. America.

GENUS XIII. SPHALEROMYCES. Receptacle two-celled, the single simple appendage bearing a series of antheridial branchlets superposed in a single row.

(1) **S. Lathrobii** Thaxter, on *Lathrobium nitidulum* Lec., *L. punctulatum* Lec., N. America.

(2) **S. occidentalis** Thaxter, on *Pinophilus densus* Lec., N. America.

GENUS XIV. COMPSOMYCES. Receptacle two-celled, the upper cell bearing the appendages and stalked perithecium in a whorl. Perithecium with two stalk-cells, the lower appendiculate.

(1) **C. verticillatus** Thaxter, on *Sunius longiusculus* Mann., N. America.

GENUS XV. MOSCHOMYCES. Receptacle two-celled, several arising from a compacted cellular base intruded into the body cavity of the host. Perithecium borne on two stalk-cells, the lower appendiculate.

(1) **M. insignis** Thaxter, on *Sunius prolixus* Er., N. America.

GROUP II. Exogenæ. Antherozoids produced exogenously. Typically aquatic.

ORDER. Zodiomyceteæ.

GENUS I. CERATOMYCES. Appendage tapering with lateral branches, receptacle few-celled, wall-cells of perithecium seven or more in each row.

(1) **C. mirabilis** Thaxter, on *Tropisternus glaber* Hb., *T. nimbatus* Say, N. America.

(2) **C. confusus** Thaxter, on *Tropisternus glaber* Hb., *T. nimbatus* Say, N. America.

(3) **C. camptosporus** Thaxter, on *Tropisternus glaber* Hb., N. America.

(4) **C. minisculus** Thaxter, on *Tropisternus nimbatus* Say, N. America.

(5) **C. filiformis** Thaxter, on *Tropisternus glaber* Hb., *T. nimbatus* Say, N. America.

(6) **C. rostratus** Thaxter, on *Hydrocombus fimbriatus* Melsh., *Philhydrus cinctus* Say, *P. nebulosus* Say, N. America.

(7) **C. terrestris** Thaxter, on *Lathrobium punctulatum* Lec., N. America.

(8) **C. furcatus** Thaxter, on *Berosus striatus* Say, N. America.

(9) **C. contortus** Thaxter, on *Berosus striatus* Say, N. America.

(10) **C. humilis** Thaxter, on *Berosus striatus* Say, N. America.

GENUS II. ZODIOMYCES. Receptacle parenchymatously multicellular, the numerous perithecia surrounded by sterile appendages arising from its cup-shaped extremity.

(1) **Z. vorticellarius** Thaxter, on *Hydrocombus lacustris* Lec., *H. fimbriatus* Melsh., and sp. indet., N. America.

In addition to the forms above enumerated, which include one hundred and fifty-two species and twenty-eight genera, a certain number of undescribed forms are known, including several new genera. Of these, three species belong to the genus Laboulbenia, two of them North American, on Bledius and Anophthalmus, and one European, on Patrobus (Peyritsch); one to Cantharomyces, on Ancyrophorus; one to Chitonomyces, on an unknown host, together with a new genus, on Bledius, and a doubtful genus on Tachinus. The total number of forms known to exist, excluding certain doubtful species referred to by Peyritsch, is thus one hundred and fifty-eight.[1] Although this number may be assumed to illustrate the group in a general way, it is certain that many important additions are inevitable, and from the data available a rough estimate of the numbers of the family existent in all parts of the world would be from five hundred to one thousand.

The following descriptions, a majority of which first appeared in the "Proceedings" of the Academy, have been largely rewritten and revised with additional notes in the light of more abundant material and a more complete knowledge of the group. As will be observed, a limited number are here described for the first time, and include some of the most important additions to the family.

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[1] To these must be added a new aquatic genus near Chitonomyces, which is alluded to under that genus, and two undescribed species of Ceratomyces.

FAMILY LABOULBENIACEÆ PEYRITSCH.

DIMORPHOMYCES Thaxter. Plate V, figs. 1–16. II. p. 240

Proc. Am. Acad. Arts and Sci., Vol. XXVIII, p. 157.

Diœcious. *Male individual* consisting of four superposed cells, the two distal ones sterile, the sub-basal producing a compound antheridium, the six antheridial cells of which are arranged in two antero-posterior rows and discharge into a common cavity lying above them, from which the antherozoids escape through a prominent tubular neck.

Female individual consisting of four superposed cells, the two distal ones sterile, the sub-basal cell giving rise to two or more perithecia and sterile appendages which alternate with one another on either side, forming a transverse series. Trichogyne short, radiately branched. Spores once septate.

The material available for the illustration of this genus, although abundant, includes, unfortunately, no young individuals in which the first stages in the development of the primary perithecia are shown. Owing to the small size of the plant and the indistinctness of its septa, it Part II. p. 140 has been difficult to determine with certainty the exact relation which the perithecia and sterile appendages bear to the receptacle. While in most cases the latter has seemed to consist of three superposed cells, as in fig. 1 or 5, in a few specimens I have thought that there was an indication of the presence of septa as is indicated in fig. 4. If the first of these alternatives proves to be correct, the portions of the receptacle which bear the appendages and perithecia must be considered as wing-like outgrowths from the basal cell; while in the second instance they would originate from a sub-basal cell. Although in no other genus, with the exception of Amorphomyces, is anything approaching a similar condition found, I am inclined to think that the first-mentioned alternative is the correct one.

In form and development the species of Dimorphomyces are very peculiar. There is a general triangular outline to the portion below the sterile cells of the receptacle, a tendency to a posterior convexity and anterior concavity; and in both species the first organs to be developed are a pair of primary perithecia symmetrically placed and followed immediately by a sterile appendage placed externally on either side. In many individuals there seems to be no further development (fig. 3); but very commonly two or four secondary perithecia are formed, alternating with as many sterile appendages. The process by which these organs are formed is unlike any corresponding process in other genera. Assuming that my observations are correct in deriving them from the sub-basal cell of the receptacle, the first step in their formation would II. p. 140 consist in the production of two anterior projections from this cell symmetrically placed on either side of the median line. The tip of each projection is cut off, and the cell thus separated develops upward into a perithecium. Meanwhile a lateral proliferation takes place below this septum, and from it arises a second projection, the upper portion of which is cut off as before, and develops into a primary appendage, external to each primary perithecium. This condition is represented in figs. 2 and 3. The same process may continue through the production of further successive lateral proliferations, new cells being separated as above described, and developing upward into new perithecia and sterile appendages. As a result of this process a fan-like habit is developed, a series of alternating perithecia and appendages extending obliquely upwards on either side from their common point of origin in the median line of the receptacle, their bases resting upon a unicellular margin (figs. 1 and 5), which results from its repeated proliferation. The alternation of perithecia with appendages appears to be invariable; except in abnormal cases, where, for example, a perithecium has failed to develop, as at the left in fig. 1.

The appendages themselves present no special peculiarities, and consist merely of a single series of superposed nearly cylindrical cells. The perithecium originates from a single cell that divides into a lower and upper portion, the former the primordial cell of the perithecium proper, the latter of the procarpe. The development of the former is made out with great difficulty, the septa being very indistinct. It is probable, however, that it corresponds in general with the course of development described as typical in the first part of this memoir; although in the mature perithecium all signs of septa have disappeared, and the cavity of the stalk-cell and of the perithecium are continuous (fig. 3), the single ascogenic cell with its ascus mass floating free within.

The spores are of the usual type, and are once-septate. As in the genus Amorphomyces, the members of any given spore pair produce one a male, the other a female individual; the two sexes being thus invariably associated, as in figs. 2 and 5.

The male individuals are very similar in the two known species, and are often indistinguishable. Owing to their minute size, I have been unable to obtain material of the youngest stages for figuring, the only early condition observed having been unfortunately lost in an attempt to mount it. In this specimen it was evident, as could be inferred from an examination of the mature individual, that the antheridium was developed as a lateral production from the sub-basal cell of the receptacle. The receptacle, as in the female, consists of four superposed cells, the two terminal ones sterile. The antheridium itself consists of a basal cell, above which are three small cells, of somewhat unequal size, from which the antheridial cells arise. The latter are arranged in three pairs; and all six cells discharge the antherozoids formed within them into a common cavity, that forms the slightly inflated base of the long tubular neck through which they are finally discharged. The formation and discharge of antherozoids continues for a considerable period, so that provision is made for the fertilization of as many secondary perithecia as may be formed upon the female individual; and the number of antherozoids eventually produced by a single individual must be very great.

The genus appears to bear no special relation to Amorphomyces, which, in all essential points of structure, with the exception of the remarkable similarity of its trichogyne, is widely different in both sexes. Yet it is singular that these, which are, with one exception, the only two diœcious genera so far discovered, should inhabit the same minute host.

Scientifically considered, the three diœcious genera, of which this may be taken as a type, may certainly claim a position first in importance among the Laboulbeniaceæ, if not among the Ascomycetes as a whole, since their morphology and development would seem to settle beyond any reasonable doubt the vexed question as to the presence of sexuality in the higher fungi. The immediate relation of the present to other genera, with the exception of Dimeromyces, is not clear; yet it seems probable that among described forms the species of Dichomyces and Peyritschiella approach it more nearly than any others. In both of these instances the same tendency towards a bilateral development is combined with a close correspondence in the sexual organs.

DIMORPHOMYCES DENTICULATUS Thaxter. Plate V, figs. 11–16.

Proc. Am. Acad. Arts and Sci., Vol. XXVIII, p. 157.

Male individual. Receptacle of four superposed cells, the distal one tapering upward, and terminated by a more or less distinctly marked, usually slightly blackish, knob. Antheridium arising from the sub-basal cell and partly united to the sub-terminal cell of the receptacle; externally nearly straight, bulging internally; its main body about as long as the usually straight terminal neck, the base of which is distinctly inflated to form the cavity into which are discharged the antherozoids. Total length to tip of receptacle, 40μ; to tip of antheridium, 50–55μ. Greatest width, 14μ.

Female individual. Sterile portion of the receptacle consisting of a large sub-terminal and much smaller nearly spherical terminal cell, the main portion consisting of two superposed cells forming a more or less three-sided body, the perithecia and sterile appendages arising in the manner characteristic of the genus. Perithecia slightly inflated, rather abruptly contracted to form the stalk portion; the tip oblique; one of the lip-cells projecting as a short but distinct tooth-like prominence; while just below this prominence a conspicuous tooth-like outgrowth arises from one of the anterior sub-terminal wall-cells, and extends obliquely upward and outward more than half its length beyond the tip of the perithecium. The stalk of the perithecium is usually strongly curved, so that the latter is bent backward beyond the terminal portion of the receptacle. Sterile appendages simple, septate, tapering slightly, usually bent away from the perithecia. Spores 22–25 × 3μ. Perithecia 65–70 × 15μ. Appendages about 110μ. Receptacle about 40μ long.

On *Falagria dissecta* Er., Waverly, Mass., and Kittery Point, Maine.

Better and more abundant material of this species has made necessary important changes in the original diagnosis above cited. The species is a rare one, occurring on the abdomen of its host close to the edges of the last abdominal rings on the upper or under sides, and may be seen projecting beyond their margin in a position indicated in fig. 2. They occur always in pairs, comprising the two sexes; and numerous pairs are not infrequently found crowded together and producing a little tuft which may be seen without great difficulty under a hand lens. The anterior face is usually turned towards the substratum, and the divergence of the appendages and perithecia gives the plant a characteristic habit, indicated in fig. 11, and makes it almost impossible to obtain a view which is either wholly posterior or wholly anterior. The species seems a very constant one, varying but slightly in size, and usually producing only two perithecia. The host, Falagria, may be obtained in great abundance from almost any decaying vegetable matter in fields, and is most readily captured by shaking such material over a white cloth. It is the smallest host known to be infested by any of the Laboulbeniaceæ.

DIMORPHOMYCES MUTICUS Thaxter. Plate V, figs. 1–10.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 104.

Male individual, as in *D. denticulatus*, slightly larger, the basal and sub-basal cells often more or less suffused posteriorly with blackish brown.

Female individual, as in *D. denticulatus*, more rigid and flattened in habit, the perithecia and appendages not bent away from one another. The perithecium larger, longer, proportionately more slender, its apex truncate or but slightly oblique, the sub-terminal wall-cells producing no tooth-like outgrowth. Spores 23–26 × 3μ. Perithecia 75–90 × 15μ. Total length to tip of perithecium, 90–130μ.

On *Falagria dissecta* Er., Waverly, Mass., and Kittery Point, Maine.

This species occurs sometimes in company with the last on the same host. It is at once distinguished by its larger unarmed perithecia, which never show any indication of the prominence so characteristic of *D. denticulatus*. Its general habit, though it develops under identical conditions, is also quite different from that of the preceding species, and no tendency to an antero-posterior divergence is observable between the perithecia and appendages. The conformation of the tips of the perithecia in either case, as shown in figs. 7 and 13, is also very different. Four or even more perithecia are not rarely developed in this species, and in fig. 1 an instance is shown of an unusually highly developed individual in which the single primary perithecium that remains is bent to the left, its fellow having been broken off or destroyed, while five new secondary perithecia are developing on either side; the youngest, at the extreme right, consisting of a mere prominence not yet separated from the proliferating marginal cell described in the preceding account of the genus. The same figure shows the remarkable phenomenon of an almost complete development of two male spores within the old primary perithecium. The species is more abundant than the preceding and more readily seen, from the greater size of its projecting perithecia.

DIMEROMYCES nov. gen. Plate IV, figs. 12–17.

Part II. p. 241.

Diœcious. Male individual consisting of a series of superposed cells from which are produced, laterally, sterile appendages and antheridia in a single series. The antheridium compound, consisting of a stalk-cell followed by four basal cells, above which are six antheridial cells arranged symmetrically in the same plane, and discharging the antherozoids into a common cavity, whence they make their escape through a terminal orifice, at the tip of a long, slender, tubular, terminal prolongation.

Female individual like the male, the antheridia being replaced by perithecia. The latter stalked, the cavity of the stalk-cell, basal cells and perithecium proper, eventually continuous, through the absorption of all the septa.

This is in some respects among the most interesting of all the genera of Laboulbeniaceæ, since it combines with a diœcious habit a more complicated development of the male individual than is found in any other instance. In Dimorphomyces, to which it is more closely allied than to any other genus, the antheridium is nearly, if not quite, as highly developed; but it is always solitary, and the receptacle is very greatly reduced, being quite different from that of the female; while in the present genus it differs only in its slightly smaller size. The antheridium is almost identical in structure with that of Dimorphomyces, from which it differs only in its more slender and elongate form, and in its free stalk-cell. The perithecium also, when mature, shows the same remarkable absorption of its basal septa which one finds in the last-mentioned genus, its whole cavity, from the apex to the insertion of the stalk-cell, becoming continuous about the time that the spores begin to mature. The trichogyne, as far as can be determined from a somewhat imperfect specimen (fig. 17), is small and irregularly inflated.

The receptacle is quite unique in structure, and apparently in development. The material available does not, unfortunately, illustrate the complete development, there being no very young stages; but it is evident that the young plant ends with a single primary appendage, which is the upper one of the series in the mature individual. Then, by successive divisions of the basal cell of the receptacle, new cells appear to be cut off from its distal end; each of which, in its turn, cuts off a small cell, always on the same side, from which the secondary appendages, the perithecia, and the antheridia are directly developed. A somewhat similar arrangement of organs is found in the female individual of Dimorphomyces; but in this case the series are twofold and the proliferations terminal from wing-like lateral outgrowths.

DIMEROMYCES AFRICANUS nov. sp. Plate IV, figs. 12–18.

Male individual brownish. Receptacle consisting of usually seven very obliquely superposed cells, from all of which, except the basal, may be developed on the side which is uppermost, a sterile appendage or an antheridium in no regular order except that the terminal cell always bears an appendage. Antheridia rarely more than three, usually two, somewhat flattened, borne on a short free stalk-cell, the basal cells small, the six antheridial cells in two transverse rows of three each, the neck long and slender, slightly curved, its base distinctly inflated. The appendages simple, rigid, septate, tapering, becoming blackish brown; the sub-basal cell somewhat constricted and deeply suffused with blackish brown. Antherozoids about $2.5 \times .75\mu$, rod-like. Antheridia, including stalk-cell, $60 \times 10\mu$, the neck, including its inflated base, about 38μ. Receptacle, $125–150 \times 35\mu$.

Female individual like the male, but larger; the receptacle usually consisting of eleven cells, the antheridia replaced by banana-shaped perithecia, one to four in number, short-stalked, brownish; the distal end more deeply suffused, and tapering somewhat abruptly to the broadly truncate apex. Spores once septate $75 \times 5.5\mu$. Perithecia, $140–175 \times 26–35\mu$, including stalk-cell. Appendages (longer), $175–260\mu$. Receptacle, $120–150 \times 35–50\mu$.

On *Pachyteles luteus* Hope, Mt. Coffee, Liberia (O. F. Cooke).

The types of this interesting form were found on two specimens of the host which were among the insects kindly loaned me for examination by Professor Cooke, and occurred on the inferior surface of the abdomen near the base of the two posterior pairs of legs. I was not able to determine from the material whether the sexes always grow in pairs, since from their position of growth it was not possible to remove a portion of the chitin bearing them without injuring the insect. It is altogether probable, however, that the development of the spore pairs corresponds to that of the other diœcious forms (Amorphomyces and Dimorphomyces).

HAPLOMYCES. Plate VII, figs. 1–10.

Part II. p. 275.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 159.

Receptacle consisting of two small superposed cells from which arise the single perithecium and the single antheridial appendage. Perithecium large, pointed, borne on a single stalk-cell surmounted by three basal cells. Antheridial appendage consisting of a basal cell surmounted by a terminal body, the antheridium, entirely divided by anastomosing septa into numerous small cells, and furnished with a short lateral projection, together with a sub-terminal short spine-like process arising from a rounded base. Asci four-spored, arising from eight ascogenic cells. Spores once septate.

Owing to the fact that no fresh material of this genus, or any of its younger stages have been examined, there are numerous points connected with it which need to be made clear. Unlike the succeeding genus, Cantharomyces, its nearest ally, the antheridium appears to be terminal, not lateral. No discharge of antherozoids was observed in any of the specimens examined, and it is uncertain how and where such discharge takes place. Certainly not through the terminal spine-like process, so characteristic in the genus, which is undoubtedly a peculiarly modified sterile cell, perhaps the remains of the original terminal spore segment. It seems more probable that a lateral projection prominent in some specimens (at the right in fig. 3) represents the point of discharge; but what relation the irregularly honeycomb-like mass of cells composing the body of the antheridium bears to this projection, or how many of these cells are really spermatic, it is impossible to say. Examined with an immersion, indications of a central cavity, containing small roundish bodies, probably antherozoids, and extending upward and outward to the external projection previously mentioned, may be made out, though not with sufficient definiteness to enable one to figure these structures. From analogy with related genera, however, there can be little doubt that some such arrangement of the spermatic cells about a common cavity must exist.

The perithecium is remarkable from the fact that it contains eight ascogenic cells arranged symmetrically in four pairs, a condition only occurring in this and, perhaps, in the succeeding genus.

The hosts of these curious little forms all belong to the staphylinid genus Bledius, common further south along the sandy or gravelly margins of streams, especially in shady places, where they may be found under stones or burrowing in the sand. The only material examined has been that contained in the collection of the Museum of Comparative Zoology at Cambridge.

Haplomyces californicus Thaxter. Plate VII, figs. 1–4.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 159.

Perithecia olive brown, tapering abruptly to the small blunt apex, greatly inflated externally, internally nearly straight; a distinct prominence, the base of the old trichogyne, usually visible on its anterior face below the apex, its basal cells short, wider than long, more or less suffused with olive brown, the stalk-cell stout, sub-triangular, hyaline. Receptacle small; its basal cell nearly hyaline, more than twice as large as the sub-basal, which is intensely blackened and quite opaque, as is the basal cell of the appendage, except along its inner margin. Antheridium twice as long as broad, slightly convex inwardly and concave outwardly; its thorn-like appendage sharp, prominent. Spores, 37–40 × 3 μ. Perithecia, 130–145 × 65 μ, the stalk-cell 45–50 × 38 μ. Receptacle, 45–55 × 15–18 μ. Antheridium, 33 × 19 μ. Total length of appendage, 48–55 μ. Total length to tip of perithecium, 240–260 μ.

On *Bledius ornatus* Lec., California.

This species was found growing on the abdomen of a single specimen of its host, examined in the collection of the Museum of Comparative Zoology. It seems to be sufficiently distinguished from the succeeding species by its olive brown color and very differently shaped perithecium. The fourteen type specimens show no variation from the form represented in the plate.

Haplomyces virginianus Thaxter. Plate VI figs. 7–10.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 160.

Perithecium short, stout, straw-yellow, outwardly inflated, the inner margin nearly straight, the distal portion conical, its apex bluntly pointed; stalk-cell long, nearly cylindrical, distally expanded slightly, the basal cells of perithecium very small, almost obsolete. Basal cell of receptacle large, the distal cell very small, and several times as broad as long, the stalk-cell of the perithecium arising from it, but also connected with the distal portion of the basal cell. Basal cell of antheridial appendage squarish, slightly broader than long, the antheridium rounded, its reticulations coarse, the thorn-like apiculus very fine (about 5 μ long) and abruptly distinguished from its flattened base. Spores, 33 × 3.7 μ. Perithecia, 110–130 × 55–60 μ. Stalk-cell of perithecium, 75–110 × 19–25 μ. Antheridium, 18 μ long, 22–23μ wide. Receptacle, basal cell, 45–50 × 18–19 μ, distal cell about 18.5 × 6 μ. Total length to tip of perithecium, 220–275 μ. Total length of appendage, 30–33 μ.

On *Bledius emarginatus* Say, Virginia.

This curious little species was found growing on the abdomen of its host. It is very distinct from either of the remaining forms, and although approaching *H. californicus* more closely in the shape of its perithecium, is at once distinguished by the great elongation of the latter's stalk-cell, which is associated with a remarkable reduction in the size of its basal cells. The sub-basal cell of the receptacle is so reduced that the stalk-cell of the perithecium appears at first to arise from the basal cell. The antheridial appendage, though almost identical in the other two species, is here distinctly different in form and general appearance.

Haplomyces texanus Thaxter. Plate VI figs. 5–6*a*.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 160.

Perithecia almost symmetrically conical, straw-yellow, tapering to the rather blunt apex; the stalk-cell nearly hyaline, more than twice as long as broad, more slender at the base; the basal cells elongate, nearly equal. Receptacle small, the basal cell nearly hyaline; the distal cell very small, slightly broader than long, sometimes blackened and opaque, the opacity including the lower outer portion of the basal cell of the appendage, the unblackened portion of which, together with the antheridium, becomes suffused with brown. Spores, 40–45 × 3.7 μ. Perithecia, 165–185 × 50–55 μ. Stalk-cell of perithecium, 65–90 × 26–33 μ. Antheridium, 32 × 18 μ. Receptacle, 37–45 × 18 μ. Total length to tip of perithecium, 315–370 μ. Total length of antheridial appendage 35–40 μ.

On *Bledius rubiginosus* Er., Texas.

Distinguished from the preceding species by its pale yellowish color, conical, nearly straight perithecium, and by the elongated basal cells of the latter.

The two varieties of this form represented in figs. 5 and 6 occurred together on the abdomen of the same individual; and though the blackened form may be taken as the type, it is improbable that the two are distinct, since similar variations in color are common in other cases.

CANTHAROMYCES Thaxter. Plate VII figs. 11–24. II.p.281.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 9; l.c. Vol. XXVIII, p. 161.

Receptacle consisting of two superposed cells, the distal producing one or more stalked perithecia, and one or more antheridial appendages. Perithecia sub-conical, borne on a single stalk-cell surmounted by three basal cells. Antheridial appendages consisting of two superposed cells, terminated by one or two cells which may bear several branches, the sub-basal cell divided into two parts longitudinally or obliquely, one of which (the antheridium) is subdivided by anastomosing septa into numerous small cells. Spores once septate. Trichogyne filamentous.

This genus is very closely allied to the preceding, differing only in the fact that the antheridium is not terminal, but lateral, on an appendage terminated by sterile branches and destitute of the spine-like process characteristic of Haplomyces. The general relations of its parts are otherwise similar, and its antheridium possesses the same characteristic irregularly honeycombed structure. In *C. Bledii*, the only species abundant material of which has been examined, two or even three perithecia may arise from the same receptacle, and very rarely two appendages. In the absence of fresh material, except in the case of the very minute *C. pusillus*, the exact nature and relations of the spermatic cells remains a matter of doubt. In one specimen of *C. Bledii*, a well-developed trichogyne is present, rather copiously branched and bearing no resemblance to the greatly reduced type characteristic of Peyritschiella and its allies. As in Haplomyces, there appear to be eight ascogenic cells, but this point has not been definitely determined. The species all occur on beetles belonging to the Staphylinidæ.

CANTHAROMYCES BLEDII Thaxter. Plate VII, figs. 17–24.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 10.

Color pale yellowish. Perithecia sub-conical, nearly symmetrical, basally inflated, borne on a well-developed stalk-cell surmounted by three smaller basal cells, one to three arising from the sub-basal cell of the receptacle. Receptacle consisting of a basal and somewhat larger sub-basal cell; often deeply and broadly blackened externally and inferiorly, in which case it projects laterally. Appendage usually single, rarely two arising from the same receptacle;

consisting of a squarish basal cell followed by a somewhat larger sub-basal cell, almost the whole of which becomes divided into numerous small cells to form the antheridium proper, which is bordered internally by a narrow sterile cell above which the appendage becomes repeatedly and variously branched; the branches seldom extending beyond the middle of the perithecium. Spores, 25 × 3.5 μ. Perithecia, 90–130 × 33–55 μ, average, 114 × 42 μ. Total length of appendage, 90–180 μ, average, 150 μ. Total length to tip of perithecia, 200–370 μ, average, 280 μ.

On *Bledius assimilis*, Champaign, Ill.

I am indebted to the courtesy of Prof. S. A. Forbes for abundant material of this species, kindly sent me from the locality mentioned. A single undetermined species of Bledius, from northern Illinois in the Museum of Comparative Zoology, was also found infested by the same parasite; but no fresh material has been available for examination. The species varies very considerably in size; and forms in which the sub-basal cell is blackened might be mistaken for a distinct species, owing to the slight distortion which accompanies the discoloration. It occurs on all parts of the host, even the legs and antennæ. A species bearing some resemblance to the present form was also found on a species of Ancyrophorus from Lake Superior; but the two specimens examined are not sufficiently perfect to warrant their description.

CANTHAROMYCES OCCIDENTALIS Thaxter. Plate VII, figs. 15–16.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 161.

More or less suffused with brown. Perithecium rather short, sub-conical, slightly inflated toward the base; the distal portion very slightly curved outward, the apex bluntly pointed; stalk-cell large, cylindrical, not exceeding the antheridium; basal cells each several times as long as broad. Basal cell of receptacle very small, the sub-basal cell much larger, inflated without blackening, or externally and inferiorly deeply blackened and slightly incurved. Basal cell of the appendage similar to the distal cell of the receptacle, larger and unmodified, or similarly blackened; the sub-basal cell large, its upper inner portion obliquely cut off and divided into numerous small cells to form the antheridium, which bulges slightly on the inner side; the appendage terminated by several superposed cells. Perithecium, 96–100 × 60 μ. Stalk-cell of perithecium, 120–140 × 26 μ. Length of appendage to tip of antheridium, 110–150 μ. Total length to tip of perithecium, 280–335 μ.

On *Bledius armatus* Er., Utah.

Distinguished from *C. Bledii* by its brown color, the greater elongation of the basal cells of the perithecium, and the relatively small antheridium, which in *C. Bledii* is external and comprises five-sixths to three-quarters of the sub-basal cell. The two specimens examined have each a single perithecium, and but one appendage, the tip of which is somewhat broken. A number of young specimens apparently belonging to this species, and occurring on *B. jacobinus* Lec., have the terminal portion of the appendage unbranched and consisting of a short tapering series of superposed cells.

The figures given represent the two type specimens which were found on the abdomen of the host.

CANTHAROMYCES PUSILLUS Thaxter. Plate VII, figs. 11–14.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 100.

Perithecium becoming reddish brown, inflated just above the base, the distal portion conical, tapering to a blunt symmetrical apex, borne on a rather short narrow stalk-cell bent towards the appendage and separated from the perithecium by three small sub-triangular basal cells. Receptacle consisting of a very small basal and a much larger rounded sub-basal cell, more or less suffused with brown, which gives rise to the stalk-cell of the perithecium and the appendage. Antheridial appendage consisting of a large squarish basal cell followed by the antheridium proper, which is primarily a large squarish cell, its outer half, or more, becoming divided by anastomosing septa into numerous small cells, the inner portion also showing a division into two or three larger cells; the whole bearing terminally a series of usually three superposed flattened cells, strongly constricted at the septa, and giving rise distally to from one to three simple cylindrical, nearly hyaline, sparingly septate branches, usually exceeding the perithecium in length. Spores, 18 × 2 μ. Perithecia, 22–26 × 30–55 μ. Total length to tip of perithecia, 80–85 μ, to tip of appendages, 90–120 μ.

On *Trogophlœus* sp. York, Maine; Waverly, Mass.

This species is perhaps the smallest of the known forms of Laboulbeniaceæ, and is somewhat difficult to discover and remove from the legs or elytra of its host, where, however, it is not rarely found. Owing to its minute size, the detailed structure of the antheridium was not plainly made out, neither was any discharge of antherozoids noticed. Its structure corresponds so closely, however, to that characteristic of the genus as emended, that there can be little doubt of the correctness of its generic reference. It occurs more commonly on the legs or near the tips of the elytra of its host, a small blackish staphylinid common on wet logs along the margins of brooks or in wet rubbish caught in similar situations.

EUCANTHAROMYCES, Thaxter. Plate VII, figs. 25–27. II p. 275

Receptacle consisting of two superposed cells, giving rise on one side to a free stalked perithecium, on the other to a free appendage. The appendage consisting of a basal and sub-basal cell terminated by a compound antheridium. The antheridium formed from numerous small cells, obliquely superposed in three rows, bordered externally by a sterile cell, and terminated by a cavity from which the antherozoids are discharged through a short, irregular, finger-like projection.

This genus is based upon the peculiar structure of its antheridium, which appears to be distinctly different from the honey-comb-like body which occurs in Haplomyces and Cantharomyces, as well as from the more simple form illustrated by Camptomyces, which is, probably, its nearest ally. The material examined consists of but two type specimens, in one of which the antheridium was in perfect condition, the terminal cavity being filled with antherozoids. It is impossible to determine in this specimen whether all or only a few of the small cells which compose the antheridium are antheridial cells; but, from analogy with Dimorphomyces and Peyritschiella, it seems probable that the majority of them are; and that the cells represented in the figure (Plate VII, fig. 27) merely represent the bases of such antheridial cells; the terminal portions extending upward and inward, and discharging into the common cavity. This matter cannot, however, be determined without an examination of fresh material of immature specimens.

EUCANTHAROMYCES ATRANI Thaxter. Plate VII, figs. 25–27.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 480.

Pale straw-colored. Perithecium rather long, slightly inflated, tapering to a blunt apex with rounded lips, its stalk consisting of a single large free basal cell surmounted by three smaller cells. Basal and sub-basal cells of the receptacle long and very obliquely superposed, lying almost side by side. The appendage consisting of a basal cell not wholly free, but partially connected with the stalk-cell of the perithecium at its base, followed by a second sub-triangular cell, the oblique upper walls of which separate it on the inside from the body of the antheridium proper, and on the outside from the narrow cell which forms the sterile margin of the latter. Antheridium sub-cylindrical with rounded apex, consisting of three series of obliquely superposed cells, decreasing in size from below upward, and running obliquely upward and outward, the lower series of six cells, the middle of four, and the upper of two; the three series terminating in a common cavity filled with antherozoids, which are discharged through a terminal irregular, finger-like projection, which is bent strongly outward. Perithecium, 135 × 35 μ. Length to tip of perithecium, 260 μ. To tip of antheridium, 150 μ.

On *Atranus pubescens* Dej., Virginia.

Two specimens of this form were found in company with *Rhachomyces lasiophorus*, on an example of Atranus kindly sent me by Mr. Pergande, and, although carefully sought for on all the available material of its rather rare host, has not been again observed. Neither of the specimens, which are both figured in the plate, are fully mature, and there is doubtless some slight further development of the perithecium. It is unlikely, however, that any difficulty will be encountered in its subsequent identification.

CAMPTOMYCES Thaxter. Plate VI, figs. 1–6.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 100.

Receptacle consisting of two superposed cells, the upper bearing the short-stalked perithecium laterally and the antheridial appendage terminally. Perithecium narrow, with coarse-lipped asymmetrical apex. Appendage consisting of a single large basal cell bearing the antheridium terminally. Antheridium multicellular, sub-conical, with a prominent terminal pore for the discharge of the numerous roundish antherozoids. Trichogyne developed as a small vesicular prominence from a permanent ear-like appendage which arises laterally from the young perithecium. Ascogenic cells two in number. Spores once septate.

It is much to be regretted that in this genus, as in all the genera closely allied to it in which the antheridium appears to be a terminal organ, no material is available which illustrates the first steps in its production. In the youngest conditions examined, the antheridium has, in all instances, attained nearly complete development, even when the perithecium is a mere bud from the sub-basal cell of the receptacle. Whether the antheridium as a whole is truly terminal, and developed from the smaller of the two primary spore segments, is uncertain. When mature, it is a somewhat complicated organ; but in a general way corresponds to that of Dimorphomyces, except in the number and arrangement of its antheridial cells. The latter appear to be placed in probably two, possibly three, vertical rows, each cell extending obliquely inward and upward towards a general lateral and partly central cavity into which they discharge, and which is usually well filled with irregularly squarish or roundish antherozoids. I have been unable to make out to my own satisfaction whether all the smaller cells of the antheridium are spermatic, and what their exact disposition is. The figures given (5 and 6) represent only in a general way the relations of the cells to the cavity for the reception of antherozoids; the view in the one case being sectional in a plane which does not show the openings through which the antheridial cells discharge their contents; in the other (fig. 6), showing the appearances visible on the anterior (inner) *surface* of the organ. The antherozoids are produced in very large numbers, and no form that I have seen is so well adapted to illustrate their discharge, which almost invariably occurs when the specimen is placed in water. This is perhaps connected with the fact that the trichogyne is very rudimentary, consisting of a small vesicular prominence, with one or two short projections, and is not in close proximity to the antheridium, so that the production of a large number of male bodies is necessary to insure fertilization. The carpogenic cell is very large, and the trichophoric cell bears the trichogyne laterally and anteriorly, the latter subtended by a peculiar and well-marked prominence. This prominence, at the left in fig. 4, constitutes the basal portion of the trichogyne, the receptive portion of which is seen in the angle between it and the projecting apex of the trichophoric cell. The latter is separated from the base of the trichogyne by a septum which was accidentally omitted from the figure. The cavity of this basal portion, which becomes indurated and persists as a slight projection on the mature perithecium (fig. 2), is *not*, as represented, continuous with that of the trichophoric cell. The ascogenic cells are two in number, and the asci do not seem strictly biseriate.

CAMPTOMYCES MELANOPUS Thaxter. Plate VI, figs. 1–6.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 101.

Perithecium tinged with brownish, slightly inflated towards the base, its distal half narrow, tapering gradually to the rounded attenuated apex, below which on one side is a rounded projection; borne on a large sub-triangular stalk-cell, surmounted by three smaller basal cells. Receptacle narrowly funnel-shaped, tapering to a pointed base, and consisting of a large basal cell, slightly translucent near its lower extremity, but otherwise becoming wholly opaque, followed by a flattened sub-basal cell, from which the mature perithecium with its stalk project nearly at right angles to the long axis of the receptacle, while distally it bears the appendage. Appendage consisting of a single squarish cell, followed by a flattened cell which bears terminally the sub-conical, slightly asymmetrical antheridium. Spores about $30 \times 3.5\,\mu$. Perithecium, $130–150 \times 30–33\,\mu$. Total length to tip of antheridium, $110–125\,\mu$. Greatest width, $25\,\mu$. Antheridium, $25 \times 16\,\mu$.

On *Sunius prolixus* Er., Waverly, Mass., and York, Maine. On *S. longiusculus* Mann., Kittery Point, Maine.

This curious species occurs rather rarely, more often on the upper than on the inferior surface of the abdomen of the two hosts mentioned, the receptacle lying close against the surface, while the perithecia project outward, often backward. Specimens on *S. longiusculus* are somewhat smaller and much paler than those on the larger host, the basal cell of the receptacle being more or less translucent. The form is not easily overlooked when mature, occurring usually in groups of half-a-dozen or more. The hosts may be found in dry hay or other rubbish in cultivated land.

ENARTHROMYCES nov. gen. Plates III–IV. Part II. p. 267

Receptacle consisting of a simple series of superposed cells, the distal ones bearing sterile appendages, those below giving rise to antheridia or perithecia or remaining sterile. Antheridia compound, terminally pointed and perforate, the six antheridial cells converging upward to a general cavity, into which they empty through narrow necks. Trichogyne simple, two-celled. Perithecia stalked, one or more formed by direct budding from the cells of the receptacle.

In the form and structure of its antheridium, and to some extent of its perithecium, this remarkable genus recalls Peyritschiella, to which it is undoubtedly more closely related than to any other. The series of specimens which constitute the types of the single species contain no very young individuals; yet it is apparent that, after the axis is formed and most of the sterile appendages have been produced, an antheridium arises, first originating as a lateral bud, in such a position that the first trichogyne when mature lies beside its apex. The antheridium is the largest thus far observed, of the compound type, and its general structure may be made out with no great difficulty. The antheridial cells are irregularly flask-shaped, and occupy the somewhat inflated basal portion of the organ, the distal part being more or less conical, and apparently originating from a single cell, the remains of a septum being usually visible (Plate III, fig. 19) just above the openings of the canals through which the contents of the antheridial cells are discharged. The cavity which it contains is of considerable size, and is often filled with free antherozoids. The latter are larger than other known forms of endogenous origin, and seem to be surrounded by a thin wall at the time of their final discharge. The trichogyne is quite peculiar, and invariable in form, being rather short and inflated, septate near the middle, and prolonged into a short terminal projection (Plate III, fig. 17, *t r*), which seems to be the only portion that is receptive, the remainder being distinctly thick walled. Indeed, it is only the terminal part of this projection that is very thin walled; so that, after fertilization, when this receptive portion has withered, the trichogyne appears to end in a short, cylindrical, and distally truncate and perforate outgrowth (fig. 18, *t r*). The young perithecia arise as lateral buds from the cells of the axis, becoming cut off from it in the form of free clavate cells (fig. 13), which become once septate (fig. 14) and follow the course of development described in Part I (p. 228).

ENARTHROMYCES INDICUS nov. sp. Plate III, figs. 13–19; Plate IV, figs. 8–11.

Pale amber or straw colored. Perithecia large, sub-cylindrical, terminally rather abruptly and symmetrically rounded below the short, clearly distinguished, broadly truncate apex, the lip-cells of which end in papillate enlargements, while one of them produces posteriorly a clavate outgrowth bent abruptly upward near its base and extending free above the apex. Below the base of this projection, and on the same side, the perithecium is prominently hunched. Basal cells of the perithecium often rounded and bulging. Receptacle consisting of from fifteen to twenty superposed cells, somewhat longer than broad, the two lowest always sterile, the third always producing a perithecium, the sixth, more commonly the seventh, producing an antheridium; the cells immediately above the third producing perithecia or remaining sterile; those immediately above the sixth or seventh producing perithecia or antheridia or remaining sterile, the total number of antheridia rarely exceeding three; the perithecia rarely produced two from a single cell. The terminal cells of the receptacle, usually five or six in number, bearing septate, simple, lateral, sterile appendages. The latter straight, usually two borne on opposite sides of a given cell, but sometimes three or four from the same cell, deeply blackened and somewhat constricted in the region of their basal septum, consisting more commonly of seven cells, the fourth and sixth, and notably the fifth, broader and shorter than the others, the terminal cell longer than the rest and tapering to a blunt tip. Similar appendages rarely produced even below the uppermost perithecium. Spores, very long and slender, 120–130 × 5 μ. Perithecia, 140–160 × 50–60 μ; the outgrowth, 35 × 10 μ; the stalk-cell, 50–85 × 25–30 μ. Receptacle, 400–680 × 25–35 μ; average, 500 × 28 μ. Appendages, 140–200 × 20 μ.

On *Pheropsophus* sp., Booloo Valley, banks of the Beeas River, Northwest India.

Sufficiently abundant material of this fine species was obtained from the inferior surface of the thorax and abdomen of an undetermined Pheropsophus from the above-mentioned locality in the collection of the Museum of Comparative Zoology. Although varying somewhat in the number of perithecia developed, it seems to be an unusually constant form. Even the sterile appendages, although they vary in number in different individuals, are remarkably uniform, and rarely vary in respect to the number of cells which compose them. In many cases the first, and sometimes others of the perithecia become aborted, as a result of the non-fertilization of their trichogynes; and there may be three or even more such undeveloped perithecia on the same individual, with from one to three or even four which have reached maturity (Plate IV, fig. 8), so that although there are more commonly not more than two perithecia in a given individual, there may be six to eight, developed and undeveloped, in exceptional cases. In their color, habit, and peculiarly blackened bases, the sterile appendages, curiously enough, recall those of the Laboulbenia (*L. Pheropsophi*), which infests a similar host in Africa and South America; so much so that a young specimen, which was the first examined, was for the moment mistaken for an abnormal condition of this species. Owing to the large size of the sexual organs, this form offers unusually good opportunities for a closer study of the sexual processes, and it is to be regretted that it should occur in so remote a locality.

It seems doubtful whether the lower half of the two-celled body described as the trichogyne is not morphologically a portion of the trichophoric cell, since, though it is separated from the latter by a constriction, no septum is visible between them. In one instance, a second trichogyne was seen developed from the base of this basal half, the first trichogyne having failed to become fertilized.

PEYRITSCHIELLA Thaxter. Plate VI, figs. 7–24; Plate II, fig. 12. Part II. p. 260

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 8, 1890.

Receptacle composed of four superposed areas: a basal consisting of a single cell; a sub-basal consisting of a single cell or of several cells transversely and asymmetrically disposed in a single row, one or more of which may be appendiculate; a sub-terminal area consisting of a similar series of several cells appendiculate at either side, and, on one side only, producing the single antheridium; and, lastly, a terminal series like the sub-terminal, but bearing one, rarely two, perithecia centrally placed; the cells of the series external to the perithecia, and the cell between them, if there are two, appendiculate. Antheridium conical, compound, forming a sharp, tooth-like projection on one side. Appendages simple, continuous, separated from the cell which bears them by a prominently constricted, usually blackened septum. Spores once septate. Perithecia symmetrical or nearly so, the tips ending in four papillæ.

This, together with the following and very nearly related genus Dichomyces, constitutes a peculiarly well marked type among the Laboulbeniaceæ, and no other form possessing a compound antheridium, with the exception of Dimorphomyces, presents the same tendency towards the production of a bilaterally symmetrical receptacle, which is so perfectly developed in Dichomyces. In the present genus, there is always an irregularity in the form, and an asymmetry in the disposition of the cells, especially in the two lower transverse series; and though in *P. geminata* a greater degree of symmetry is attained than in any other species, the lower series is always asymmetrical, and in all cases only a single antheridium is ever found.

The development of the receptacle is comparatively simple. The germinating spore, as in fig. 11, develops a terminal appendage which corresponds to the appendage lying at the left of the perithecium in figs. 8 and 10, or between the two perithecia in fig. 7. The larger, lower segment of the spore then divides into four cells, by the formation of three septa (fig. 12). The lower of these, the basal cell of the receptacle, undergoes no further modification, and in the single species *P. curvata*, the sub-basal cell remains unchanged. In all the other species, however, the sub-basal cell and the two cells above it become divided in a characteristic fashion. This division is effected by the formation of oblique septa cutting off the two upper angles of the cell, as in fig. 13. The small triangular cells thus formed begin to grow obliquely outward and upward, as seen at the right in fig. 13, and through the formation of further oblique divisions in these cells the characteristic transverse series result (fig. 14). The number and position of the appendages varies in different species and in different individuals, as indicated by the figures, and are quite peculiar in structure and appearance. They are simple and continuous, or sometimes pseudoseptate, and always connected with the cell that bears them by a characteristically constricted, usually blackened septum. They vary in shape from a mere bladder-like oval cell (fig. 20, Plate VI) to a more highly developed form, such as occurs in *P. curvata* (fig. 9). The appendages of the following genus, Dichomyces, are similar in all respects; but in no other case, with the exception of the species of Chitonomyces and its nearest allies do appendages occur having a similar appearance.

A single antheridium only is produced on one side from the sub-terminal member of the superposed cell-series. Their structure corresponds very closely to that of Dimorphomyces, except that there appear to be not more than four antheridial cells (Plate II, fig. 12), which discharge into a common cavity above. The latter forms the slightly inflated base of the terminal conical portion of the organ, the antherozoids, which are comparatively minute, making their way through a pore at its apex.

The perithecia, except in *P. geminata*, are usually solitary, and arise normally from the distal cell-series; but in abnormal cases they may be produced externally from the sub-distal or even the lower series (*P. geminata*). In structure, the perithecia present no great peculiarities; the cell-rows containing each four cells, the lip-cells being usually characteristically papillate, and symmetrical or nearly so. The ascogenic cell is commonly solitary (Plate I, figs. 27–31); but in some instances there appear to be two. The trichogyne, in the few cases in which it has been observed, is very rudimentary, consisting of a vesicular prominence, sometimes showing a tendency to produce slight protuberances, as in the case of Camptomyces.

The four known species all occur on terrestrial beetles belonging to the Carabidæ and Staphylinidæ, and on account of their small size and appressed habit are usually detected with difficulty.

In the following descriptions the side which bears the antheridia is spoken of as the anterior, the opposite as the posterior face of the individual. The antheridium may thus be described as occurring on the left side.

PEYRITSCHIELLA CURVATA Thaxter. Plate II, fig. 12; Plate IV, figs. 11–18.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 8.

Perithecia hyaline, nearly straight, tapering to the symmetrically four-lobed apex, bent at an angle to the axis of the receptacle, the curvature of which it continues. Receptacle consisting of two superposed cells, followed by two transverse series of cells of variable numbers (four to seven); the terminal bearing one, rarely two, perithecia, with a group of sterile appendages on either side, the sub-terminal producing on one side, the sharply pointed antheridium with or without one or more adjacent sterile appendages; on the other side a group of from one to three similar appendages. Appendages simple, cylindrical, continuous, or pseudoseptate, hyaline, sometimes becoming tinged with brownish. Spores, 26 × 3.5–4 μ. Perithecia, 90–100 × 22–29 μ. Appendages (longer), 60 μ. Total length to tip of perithecium, 280–300 μ.

On *Platynus cincticollis* Say. Vicinity of New Haven, Conn., of Cambridge, Mass., and of Kittery Point, Maine.

The more common species of the genus occurring on the right shoulder of its host, and sometimes on the adjacent edge of the elytra. It is distinguished from the three remaining species by the absence of the lower transverse series of cells, the sub-basal cell of its receptacle remaining undivided at maturity. In very rare instances, two perithecia may be borne on a single individual; but I have seen but two cases of this kind among some dozens of specimens. The curved habit of the species is doubtless due to its position of growth upon the host, and is a character of little importance. The beetle on which it is found is common in the localities mentioned, along small brooks, where it may be found, concealed beneath stones, sticks, and rubbish generally, in shady places.

PEYRITSCHIELLA GEMINATA Thaxter. Plate IV, figs. 7–8 and 24.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 101.

Hyaline. Receptacle asymmetrical, consisting of a single basal cell followed by three successive, more or less definite, transverse rows of cells. The lowest of these rows is the most variable and irregular, consisting of from two to four cells, one of which, larger than the rest, is an axile cell continuing the basal cell directly, while the remaining one to three cells are cut off from it on one side, each successive cell smaller and placed higher in the series, the outermost and uppermost bearing one of the sterile appendages characteristic of the genus. The second row also consists of a larger median cell, which is free for a short distance on one side, and on both sides of which are cut off, as in the first row, from two to four cells, the smaller uppermost ones on both sides giving rise to from one to three appendages, according to the number of the cells. The upper row is either symmetrical or asymmetrical, according as it gives rise to two or to only one perithecium. In the first instance it consists of a median cell, above which are produced two sterile appendages, and a variable number of cells cut off laterally as in the lower rows, but nearly symmetrical in size and shape, the outermost bearing sterile appendages. If one perithecium only is produced, the row is asymmetrical, and a greater number of appendages appear on one side of the perithecium than on the other. Perithecia very slightly inflated near the base, tapering abruptly but slightly to the spreading apex, which is four-lobed, the lobes rounded, large and prominent. Spores about 37 × 3.7 μ. Perithecia, 75–80 × 18–22 μ. Total length to tip of perithecia, 220–260 μ (150 μ in specimens from the smaller host).

On *Pterostichus luctuosus* Dej., *P. erythropus* Dej., and *P. patruelis* Dej., Kittery Point, Maine; Arlington, Mass.

Unlike the other species, this form not infrequently produces two perithecia, the arrangement of its distal cells in such cases closely resembling that of Dichomyces. The main body of the receptacle is, however, asymmetrical, and the antheridium occurs only on one side.

It is distinguished from the preceding species by its more slender form, smaller and shorter appendages and perithecia, and especially by the division of the sub-basal cell of its receptacle to form an incomplete transverse series, or rather half-series, of cells. Its antheridium is small and inconspicuous, occurring on one side as in the other species. It may be found growing on the inferior surface of the prothorax near its anterior margin, and on the adjacent posterior margin of the prothorax, as well as on the anterior legs. In the last position the individuals become very considerably distorted in form, and in such specimens several instances have been observed in which perithecia were developed from the lower and middle transverse series of cells on the right side (opposite the antheridium).

The species is a rare one, though the hosts which it infests are not uncommon under stones or in rubbish near the margins of ponds or streams.

PEYRITSCHIELLA MINIMA Thaxter. Plate VI, figs. 19–21.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 266.

Hyaline or slightly yellowish. Perithecia somewhat asymmetrical, large, stout, tapering rather abruptly to the blunt apex, which terminates in four not very prominent, nearly symmetrical papillæ. Receptacle stout, sub-triangular in form, consisting of a rather small, often slender, basal cell, followed by the usual three transverse series of cells. The lower of these consists of the median or primary cell, on one side of which a single small cell is cut off, while on the opposite side a series of four or more cells, mostly appendiculate, extend obliquely upward and outward, overlapping one another to some extent. The middle series consists of a large median cell, on either side of which numerous (four or more) appendiculate cells extend obliquely upward and outward, and produce, on one side, the large pointed antheridium, which does not usually project beyond the margin of the receptacle. The distal series, like the sub-distal, composed of fewer cells and bearing the single perithecium. Appendages oval or short cylindrical, becoming brownish; their basal septa large, but not conspicuously blackened. Spores, 37–40 × 4 μ. Perithecia, 100 × 33 μ. Appendages (longest), 33 μ. Total length to tip of perithecium, 190–220 μ. Receptacle, 90–110 × 50–58 μ.

On *Platynus cincticollis* Say. Vicinity of New Haven, Conn.; Weston, Mass.; York, Maine.

A rare species occurring near the extremity of the anterior legs of its host, where, owing to its compact form and small size, it is easily overlooked. It is very distinct from the two preceding species, and peculiar from its sub-triangular form, from the presence of cells cut off on *both* sides of the primary or median cell of the lower transverse series, and from the numerous short, inflated, bladder-like appendages. The latter are thickly clustered on the left margin of the receptacle, while the right presents an unbroken line from the foot nearly to its summit. The habitat of the host has been already mentioned under *P. curvata*, and both species have been found on a single individual.

PEYRITSCHIELLA NIGRESCENS Thaxter. Plate VI, figs. 22, 23.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 184.

Receptacle sub-triangular in form, consisting of a single basal nearly hyaline cell followed by the usual three series, the lower broadly edged with black on either side, consisting of a long median cell from which three cells are cut off on the right and two on the left; the middle series of about ten cells, which form slight blunt appendiculate projections on either side, extending much higher on the left than at the right, where the single antheridium is situated; the upper series shorter than the middle, bearing the single stout, asymmetrical perithecium, on either side of which are several short appendages asymmetrically placed. Perithecia, 65 × 19 μ. Receptacle, 70 × 37 μ. Total length, 130 μ.

On *Philonthus debilis* Grav. Waverly, Mass.

The single type from which the above description is drawn was found on one of the posterior legs of its host, the figures given representing an anterior and posterior view of the same specimen. The compact sub-triangular form of the receptacle and the stout perithecium connect it more closely with *P. minima* than with either of the other species; while the external blackening of its lower cell series suggests some of the species of Dichomyces. In its asymmetrical development and single antheridium, however, it corresponds exactly to the type structure of Peyritschiella. The perithecium of the unique type is not quite mature, and more fully developed material may show that its apex becomes characteristically papillate as in the other species.

Part II. p. 249

DICHOMYCES Thaxter. Plate VI, figs. 25–36; Plate VIII, figs. 11–14.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 183.

Receptacle flattened, sub-triangular; consisting of a single basal cell followed by three transverse series of cells symmetrically placed; the distal row bearing a pair of perithecia symmetrically placed; or a single perithecium, the fellow of which is undeveloped, together with certain sterile appendages; the sub-distal row producing a pair of compound antheridia symmetrically placed and subtended by one or more sterile appendages. Perithecia symmetrical. Spores once septate. Appendages and antheridia as in Peyritschiella.

This genus, although very closely related to Peyritschiella, is distinguished by the bilateral symmetry which characterizes not only the arrangement of the cells of the receptacle itself, but of the organs produced from it, namely, the antheridia and perithecia; although in a single species (*D. inæqualis*) one perithecium only is developed, which is, however, placed symmetrically in relation to the cell from which, in the other species, a second perithecium arises. Apart from this bilateral symmetry, the structure and development of the members of the two genera are identical, and were it not for the fact that of the eight species included by them, four correspond exactly to one, and four to the other type, the two genera might readily be united. The four species of Dichomyces are among the most striking and curious in form of all the Laboulbeniaceæ. They have been found thus far only on beetles belonging to the Staphylinidæ, such as inhabit rather dryer situations, in most cases common among rubbish in cultivated fields.

In the following descriptions the face bearing the antheridia is spoken of as anterior.

DICHOMYCES FURCIFERUS Thaxter. Plate VI, figs. 25–29.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 184.

Receptacle consisting of a small basal cell, which is nearly hyaline distally and suffused with brown basally, the receptacle above gradually expanding into a more or less fan-like form, the basal portion wholly black and opaque, the blackened area extending upward externally and including a prong-like projection with one or two appendages at its base, which extends above the base of the perithecium and forms the terminal portion of the sub-distal transverse series of cells on either side; the latter, seven in number, becoming generally suffused with blackish brown, the long rectangular median cell usually more or less distinct, the remainder partly or wholly opaque and indistinguishable; the antheridia lighter brownish. The distal row of cells seven in number, their septa straight, thin, and clearly defined; the middle cell of the series bearing distally two appendages, placed antero-posteriorly, the terminal cells of the series on either side also bearing two appendages, the inner slightly anterior. Perithecia bent slightly forward, tapering very slightly to the blunt apex, which bears a short, recurved, tooth-like projection on either side from each anterior lip-cell. The perithecia and distal row of cells faintly tinged with reddish purple. Appendages short, simple, hyaline, cylindrical, with a constricted blackish base. Perithecia, 63 × 16–18 μ. Receptacle: length to base of perithecia about 90 μ; to tips of external projections, 100–120 μ; greatest width, 55–60 μ.

On *Philonthus debilis* Grav., Waverly, Mass., and Kittery Point, Maine.

A most singular plant looking like a two-pronged fork or a pair of inverted pincers, between the black arms of which arise the two perithecia. The lower portion of the receptacle is so opaque that the cell structure is indistinguishable; but, as far as it can be made out, the lower transverse series of cells consists of a long median cell, on either side of which two, perhaps three, cells are cut off in a fashion similar to that represented in the figure of *D. princeps* (Plate VIII, figs. 11–12). In the present, as well as in the remaining species, the appendages vary somewhat in number according to the number of terminal cells in the distal and sub-distal series, which is not quite constant; and, in the majority of individuals, but few of the appendages remain unbroken at maturity. Of the two appendages situated between the perithecia, one represents the original terminal appendage of the germinating spore. The general form of the receptacle is quite characteristic, and in the region of the distal series of cells it is distinctly concave on the anterior side, the posterior face being somewhat convex.

From the fact that its host is dark-colored, while the parasite itself is partly blackened, it is often very difficult to detect, lying, as it generally does, appressed against the surface of the former. It sometimes occurs, however, in such large numbers that it is seen without any difficulty, and in such cases, although it is usually found on the under surface of the abdomen, it may extend to the legs, thorax and all parts of the body of its host. Its natural position seems to be with the tip of the perithecium turned toward the extremity of the insect's body, and the anterior face turned inward, the perithecia being turned slightly backward (upward). Although the host is very common, this species, like its relatives in the genus, seems to be decidedly rare.

DICHOMYCES INÆQUALIS Thaxter. Plate VI, figs. 30–34.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 103.

Receptacle as in *D. furciferus*, its fork-like projections prominent and indistinctly septate, the distal row of cells bearing a single perithecium; otherwise symmetrical, except that the sub-median cell, above which a second perithecium arises in *D. furciferus*, is much reduced in size. Appendages ten to twelve, one external to and near the base of each antheridium, two above the median cell of the distal row, and three to four borne one from each of the three to four cells of the distal row external to the sub-median cells, all arising as in *D. furciferus*. Perithecium large, slightly inflated towards the base; or sub-cylindrical, tapering abruptly at the extremity to a sub-truncate apex destitute of appendages. Spores, 26 × 3.5 μ. Perithecia, 100 × 25 μ. Receptacle, length to base of perithecium, 92 μ; length to tips of lateral forks, 110–130 μ; greatest breadth, 50–60 μ. Total length to tip of perithecium, 180–190 μ.

On *Philonthus debilis* Grav. Kittery Point, Maine, and Waverly, Mass.

This species occurs, sometimes in company with *D. furciferus*, on the abdomen, more rarely on the legs and thorax of its host. It is at once distinguished by its solitary perithecium, which is destitute of the terminal outgrowths peculiar to the last named species. It is much more common in the localities mentioned than its ally, and in none of the numerous specimens examined does there appear to be any variation in the points of structure which distinguish it. In no instance was any attempt observed to produce the usual pair of perithecia, and the single perithecium, by its larger size, somewhat different form, and abruptly truncate apex, serves readily to distinguish it.

DICHOMYCES INFECTUS Thaxter. Plate VI, figs. 35–36.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 102.

Receptacle consisting of a short basal cell succeeded by an axile cell placed vertically, on either side of which a series of three obliquely superposed cells forms a blackened border. The remainder of the receptacle consists of two successive transverse symmetrical rows of cells, the lower row made up of three central and several smaller external cells, terminating on either side in a short, blunt projection below the prominent antheridia; beside which arise externally single sterile appendages. The distal row is composed of seven cells, the external cells on either side not extending beyond the bases of the perithecia and destitute of appendages; two appendages arise between the perithecia, one on either side. Perithecia two, closely approximated, arising from single broad, flattened cells, short and stout, tapering slightly toward the sub-truncate apex, which is destitute of papillæ or appendages. Perithecia, 66 × 22 μ. Receptacle, 60 × 40 μ.

On *Xantholinus obsidianus* Melsh. Waverly, Mass.

Two specimens of this small form were found at the tip of the abdomen of its host, only one of which is preserved as the unique type of this well-marked species. Its broad, stout perithecia, and the absence of any external appendages on the distal series of cells, distinguish it readily from other species. Although sought for diligently, it has been found but once, notwithstanding the fact that its host is a beetle common in cultivated fields, where it may be found running over freshly turned soil or concealed in decaying vegetable matter.

DICHOMYCES PRINCEPS Thaxter. Plate VIII, figs. 11–14; Plate II, fig. 11.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 479.

Nearly hyaline, becoming slightly and uniformly tinged with pale reddish brown, sometimes narrowly edged with blackish near the base. Receptacle large, consisting of a single small squarish basal cell, above which are three successive transverse rows of cells placed side by side, the upper margin of each series convex; the lower series consisting of a long narrow axial cell, with three or four more or less obliquely superposed cells on either side; the middle series consisting also of an axial cell, with five to eight cells on either side, which extend obliquely upward and outward to form a free rounded projection, each cell of which bears a short appendage, the antheridia prominent at the base of each projection; the third or distal transverse series like the second, the cells often slightly more numerous, forming projections in a similar fashion on either side which bear the same short appendages. The axial cell of the terminal series is followed by two small cells, each bearing a short appendage, on either side of which a large somewhat flattened cell forms the base of the perithecium. Perithecia two, more or less divergent, elongate, slightly inflated and tapering rather gradually to the blunt apex. Perithecia, 110–165 × 22–30 μ. Spores, 38 × 4 μ. Receptacle, 150–180 × 70–75 μ.

On *Philonthus sordidus* Grav. Waverly, Mass.

This fine species is by far the largest and most conspicuous member of the genus, and, owing to the absence of any deeply blackened portions, illustrates the typical form more clearly than any of its allies. I have met with it on one occasion only, when several hosts were collected from a heap of rubbish near cultivated land, on which the parasite occurred in great numbers, thickly covering the lower surface of the abdomen and extending to the legs and thorax. Unfortunately, all but one of these hosts made their escape in transit, but the single one remaining has furnished abundant material of the mature form. Owing to its light color, large size, and more than usually divergent, though not erect, habit of growth, it is not readily overlooked on the black abdomen of its host.

CHITONOMYCES Peyritsch, Plates VIII and XXVI. Part II. p.263

Sitz. d. k. Acad. d. Wiss. LXVIII, p. 250 (1873); Heimatomyces Peyritsch, l. c. p. 251; Heimatomyces emend., Thaxter. Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 30.

Receptacle consisting of a basal and a terminal portion; the former consisting of two superposed cells, and three or four upper smaller cells which form the base of the perithecium; the latter consisting of four cells lying beside the perithecium, the terminal cell always free, originally more or less dome- or bell-shaped, bearing a single terminal appendage, and sometimes becoming otherwise modified at maturity; the sub-terminal cell connected on its inner side with, or rarely free from, the two cells below it, from the upper of which is separated a small cell that bears terminally, in the angle formed by the perithecium and the receptacle, one or two appendages, beside which is situated the usually small antheridium (?). Appendages slender, filamentous, simple, aseptate or spuriously septate, hyaline, evanescent, the base blackened and slightly constricted. Perithecium more or less completely united to the distal portion of the receptacle, each series of wall-cells containing not more than six cells, some of which may be appendiculate; the apex often variously modified. Spores fusiform, once septate.

Since the description of numerous species under the name Heimatomyces, I have had an opportunity of examining specimens of *Chitonomyces melanurus* Peyritsch, and, as I formerly suggested, the two genera prove identical. I have therefore concluded to use the latter name to distinguish the genus; since, although I very much dislike to regard the rules of priority at the expense of those of common sense, it seems desirable that the nomenclature adopted in the present monograph should be, in so far as possible, a fixed one, and the name Chitonomyces undoubtedly has precedence in the present instance to the extent of nearly half a page.

The genus is one the position of which has been, until the present paper was in press, quite uncertain; the character of the sexual organs not having been ascertained with sufficient exactness to warrant any definite statement concerning them. The very recent discovery, however, of an undescribed and very closely allied aquatic genus, in which the antheridium is so placed that it can be readily seen, renders its position no longer doubtful, and confirms my first impression, which was based on the general resemblance of its appendages and the structure of its receptacle to those of Peyritschiella. The new genus, a description of which is necessarily reserved for a succeeding supplement, is characterized by a general structure curiously intermediate between that of Chitonomyces and the genus last mentioned, the small but very definite compound antheridium occupying a position on the anterior margin of the plant just below the base of the perithecium.

In the present genus, the antheridium, or what I have taken to be that organ, lies just beside the bases of the lower appendages, and has not been satisfactorily made out, owing to the small size and lack of definition in the cells lying in this region. In *C. rhyncostoma*, what appears to be the neck of the antheridium becomes enlarged, as the individual matures, and projects as a conspicuous hook-like prominence from the angles between the perithecium and the appendage (Plate XXVI, fig. 18). The character of the trichogyne is also a matter of uncertainty, and although I have definitely made out the carpogenic and trichophoric cells, the latter terminating close beside the supposed antheridium, I have been quite unable to determine whether one of the two "appendages" was in reality a trichogyne or whether, as is more probable, the latter is reduced merely to a slightly inflated prominence. Owing to the minute size of a majority of the species, and the difficulty in obtaining material of young individuals, the determination of these matters is by no means easy, and involves an expenditure of time that I have been unable to afford.

In other respects the structure of the members of the genus is well defined and remarkably constant; although the perithecium is subject to curious variations of form, and the terminal portion of the receptacle, especially its terminal cell, is often so modified as to obscure its true structure. In *C. melanurus*, for example, the terminal and the sub-terminal cells are, at maturity, opaque and indistinguishable, the former becoming proliferous below its original apex and developing a hook-like extremity, the insertion of the originally terminal appendage being turned to one side, and visible only as a slight prominence from its inner margin (Plate XXVI, fig. 19). A somewhat similar modification is seen in *C. marginatus*, in which the whole distal portion of the receptacle becomes blackened, and the terminal cell is similarly proliferous (Plate XXVI, figs. 20 and 21; Plate VIII, fig. 27). The curious outgrowths from the wall-cells of the perithecium are remarkable from the fact that they are not confined to any special cell or even cell-series, being quite variable in position, as in *C. paradoxus*, *C. appendiculatus*, *C. spinigerus*, *C. uncinatus* and others. The appendages closely resemble those of Peyritschiella, and are very slender and evanescent, being usually completely broken off in mature specimens, the blackened bases alone remaining. The more or less dome-like cell which bears the terminal appendage is identical with the similar cell which bears this appendage in the last-mentioned genus.

Reference has already been made to the form of the foot, which is peculiar to this and the succeeding genus, and seems undoubtedly designed to allow a greater freedom of motion necessitated by the exigencies of life in the water on a rapidly moving host. The base of the foot, by which alone it is attached to the host, is rather narrow and pointed, while the upper portion is more or less rounded, and serves as a fulcrum on which the individual may roll from side to side through a considerable arc. The remarkable constancy with which the different species occur in definite positions has also been previously alluded to (p. 246); and, as will be seen, is practically invariable in every instance. All the species are aquatic, and are, so far as known, confined to hosts belonging to the family Dytiscidæ.

As in previous instances, the side bearing the perithecium is considered anterior, the lower appendages are thus described as arising from the left side. It may be remarked in passing that species credited to Connecticut only are undoubtedly as widely distributed as the others, this being the only locality in which they have been carefully sought for.

CHITONOMYCES PARADOXUS (Peyritsch). Plate VIII, figs. 17–21.

HEIMATOMYCES PARADOXUS Peyritsch, Sitz. d. k. Acad. d. Wissen. Bd. LXVII, p. 251; Wien, 1873, Plate III, figs. 35–39; Winter, Die Pilze Deutschl. II, p. 525, p. 920, fig. 5; Sorokin, Veg. Par. of Man, etc., p. 425, Plate XXXII, figs. 763, 770; Saccardo Sylloge, Vol. VIII, p. 915; Berlese, Malpighia, Vol. III, p. 60; Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 32.

Pale straw color becoming tinged with amber brown. Perithecium asymmetrical, the irregular lip-cells lateral and internal, the sub-terminal wall-cells of one of the external series produced to form a pointed terminally curved outward horn-like projection; a prominent ridge extending transversely on the left side from about the centre of the perithecium across the sub-terminal cell of the receptacle. Receptacle of the usual form, the basal cell large, the sub-basal cell flattened, the terminal and sub-terminal cells projecting almost wholly free beside the perithecium. Spores strongly curved, fusiform, 65 × 7 μ. Total length to tip of perithecial horn about 225 μ; to tip of receptacle, 150–185 μ. Greatest width, 60–75 μ.

On *Laccophilus maculosus* Germ., New England; on *Laccophilus* sp., Kansas (Barber); on *L. minutus* Sturm., and *L. hyalinus* Dej., Europe (Peyritsch).

This species, which is the largest of the genus, occurs invariably on the outer margin of the left elytron, somewhat beyond the middle, where it grows in groups of from two to half-a-dozen, and is very easily seen from its large size. It is not uncommon, and is not to be confused with any other species from the terminal, horn-like outgrowth of its perithecium.

CHITONOMYCES APPENDICULATUS Thaxter. Plate XXVI, figs. 25–26.

HEIMATOMYCES APPENDICULATUS: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 31.

Becoming faintly brownish. Perithecium tapering to a rather sharp apex, curved strongly outward, hunched externally and bearing a straight, sub-clavate, one-celled, brownish appendage arising externally some distance below the apex, projecting outward and upward at an angle of about 45°. Basal cell of the receptacle rather narrow, twice as long as the squarish sub-basal cell. Spores, 32 × 3 μ. Perithecia, 55 × 15 μ to 75 × 22 μ. Basal and sub-basal cells, 30–45 μ in length. Perithecial appendage, 30–33 × 4 μ. Total length to tip of perithecium, 100–130 μ. Greatest breadth, 30–36 μ.

On *Laccophilus maculosus* Germ., Connecticut.

A rare species, confined to the anterior pair of legs of its host, and distinguished at once by its clavate perithecial appendage, which corresponds to the similar horn-like projection from the perithecium of *C. paradoxus*, but is very different in form and in its relation to the other parts of the perithecium.

CHITONOMYCES DISTORTUS Thaxter. Plate XXVI, figs. 29–30.

HEIMATOMYCES DISTORTUS. Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 477.

Pale yellowish, more or less clavate in general form. Perithecium inflated, its external margin strongly curved, becoming abruptly constricted below a long, slender, tubular, terminal

mouth, which is usually, but not always, bent abruptly outward almost at right angles to the nearly straight inner margin of the perithecium. A short, straight, bluntly-pointed, rather stout appendage arises on one side only of the perithecium, just below this tubular apex beyond which it projects. The basal and sub-basal cells of the receptacle about equal in length, the latter broader: distal portion of the receptacle composed of the usual four cells, the sub-terminal cell forming a distinct external prominence below the terminal cell, which is bent toward and partly overlaps the perithecium. Perithecium (main body), 60 × 18 μ, its tubular apex, 18–25 × 6 μ. Spores, 20 × 3 μ. Length of receptacle, 110 μ.

On *Laccophilus maculosus* Germ., Connecticut.

A singular species appearing at first sight malformed or abnormal. It occurs in company with *C. appendiculatus* on the anterior legs of its host, and is at once recognized by the tubular prolongation of the apex of its perithecium.

CHITONOMYCES SPINIGERUS Thaxter. Plate VIII, figs. 15–16.

HEIMATOMYCES SPINIGERUS: Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 478.

Brownish yellow. Perithecium small, its tip slightly exceeding that of the receptacle; its extremity blunt, lobed, curved outward, and bearing two projections unequal in size just below the tip, one of which extends outward beyond the perithecial margin as a blunt prominence. Basal cell of the receptacle often bent, expanding distally, much longer than the flattened sub-basal cell: the distal portion of the receptacle with greatly thickened external walls, and consisting of the usual four cells, the terminal one short, with a broad base and bent towards the apex of the perithecium. Three small cells are distinct below the perithecial cavity, from the outer of which is produced externally a prominent spur-like process. Perithecia, 55 × 15 μ. Total length to tip of perithecium, 88–90 μ. Spur-like process, 12–30 μ long.

On *Laccophilus maculosus* Germ., Connecticut.

Distinguished from all other species by the spur-like process from the base of the perithecium. The septa are all defined with unusual clearness, the external walls being greatly thickened. Apparently among the rarest of the twelve species inhabiting this host.

CHITONOMYCES UNCIGERUS Thaxter. Plate XXVI, figs. 27–28.

HEIMATOMYCES UNCIGERUS: Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 478.

Pale yellowish. Perithecium moderate, rather broad, its outer edge straight, its upper fourth free from the receptacle, its prominent bluntly-tipped extremity bent abruptly outward at right angles: a slender hooked appendage arises from a point close to the receptacle about two-thirds of the distance from the base to the apex of the perithecium, projecting from it obliquely outward. Basal cell of the receptacle large and long, the sub-basal cell small, sub-rectangular, flattened: the distal portion composed of the usual four cells, the terminal one not very prominent, and bent strongly toward the perithecium. Perithecia, 80 × 22–25 μ. Spores, 45 × 4 μ. Perithecial appendage about 22 μ long. Receptacle, 132 μ long. Total length to tip of perithecium, 135 μ.

On *Laccophilus maculosus* Germ., Connecticut.

The more or less wedge-shaped apex of the peritheeium of this very distinct form projects outward abruptly at right angles to the straight outer perithecial margin. The hook-like appendage is quite unlike that of any other species in form and position, and, occurring only on one side, is not seen unless the perithecium lies at the right. It occurs with *C. spinigerus*, *C. hyalinus*, and rarely *C. marginatus*, on the posterior legs of its host.

CHITONOMYCES MELANURUS Peyritsch. Plate XXVI, fig. 19.

Sitz. d. k. Acad. d. Wissen., Bd. LXVII, p. 251, Plate III, figs. 30–34; Wien, 1873; Winter Die Pilze Deutschl., Bd. II, p. 924, p. 920, fig. 4; Sorokin, Veg. Par. of Man, etc. Vol. II, p. 424, Plate XXXII, fig. 771; Saccardo Sylloge, Vol. VIII, p. 914; Berlese, Malpighia, Vol. III, p. 59.

Straw colored, becoming faintly brownish. Perithecium slightly inflated near its base, its sub-terminal wall-cells expanded to form a projection from the outer and inner margin, each of which extends a little beyond the small hyaline apex which lies between them; the outer projection smaller and distinctly brownish, the inner nearly twice as broad and hyaline. The two lower cells of the receptacle nearly equal, forming a rather slender basal portion, above which it expands somewhat abruptly: the terminal and sub-terminal cells deeply blackened, the latter proliferous externally below the insertion of the appendage, which is thus turned inward, and becomes lateral in position, the proliferation extending some distance beyond it, and forming a terminal, translucent, outwardly turned hook. Length of perithecium, 95–100 μ. Total length to tip of perithecium about 150–160 μ; to tip of receptacle, 145–150 μ. Greatest width, 30–35 μ.

On *Laccophilus minutus* Sturm. and *L. hyalinus* Dej., Europe.

This peculiar species, which is the type of the genus, does not appear to occur in this country, its place being taken curiously enough by the succeeding species, which occurs in exactly the same position often in company with *C. paradoxus*, and exhibits a somewhat similar proliferation of the terminal cell of the receptacle. The material from which the accompanying figure and description were derived was found on a specimen of *Laccophilus* from Germany in the collection of the Museum at Cambridge. Although Peyritsch placed it in a genus distinct from *C. paradoxus*, there is no doubt whatever as to the generic identity of the two forms.

CHITONOMYCES MARGINATUS Thaxter. Plate XXVI, figs. 20–22; Plate VII, figs. 25–27.

HEIMATOMYCES MARGINATUS: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 34.

Long and slender, at first nearly hyaline, then yellowish. Perithecium straight, then suddenly bent inward below the hyaline, neck-like, strongly curved tip. Basal cells of the receptacle sub-triangular, the sub-basal half as large as the basal, the three cells at the base of the perithecium more than usually developed: the terminal cells all becoming black and opaque at maturity; the terminal one continued by a squarish outgrowth basally hyaline, at first lateral and external, becoming terminal (the true apex of the cell being pushed inward and becoming lateral), hardly exceeding the tip of the perithecium, which it conceals. Spores, 30 × 3 μ. Perithecia, 95–110 × 22 μ. Total length to tip of perithecium, 140–160 μ. Basal cells of receptacle, 25 μ.

On *Laccophilus maculosus* and *Hydroporus spurius*, Connecticut, Maine; *Laccophilus* sp., Kansas, Barber.

A form peculiar for the modification of the terminal cells of the receptacle, which makes the perithecium appear as if bordered by a black band. It is found in company with *C. paradoxus*, and recalls in some respects the preceding species, which is similarly associated on the left elytron of its host. In one instance a few specimens were found on the left posterior leg, but such a position is exceptional.

CHITONOMYCES RHYNCOSTOMA Thaxter. Plate XXVI, figs. 17–18.

HEIMATOMYCES RHYNCOSTOMA: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 33.

Evenly suffused with dull amber-brown. Perithecium relatively large, the broad extremity abruptly hooked inward, so that the papillate apex becomes lateral and internal; the external series of wall-cells prominent with conspicuous septa. Basal cell of the receptacle rather short, somewhat inflated; the sub-basal cell much flattened; the terminal and sub-terminal cells about equal in length, forming together an outwardly-curved, finger-like projection, exceeding the perithecium: a short but rather conspicuous hook-like structure (antheridium?) arises from the angle between the perithecium and the receptacle on the left side. Spores, 26 × 3 μ. Perithecia, 75 × 22 μ. Total length to tip of perithecium, 100 μ. Basal portion of receptacle, 25–30 μ long.

On *Laccophilus maculosus* Germ., and *Hydroporus spurius* Lec., Connecticut.

This species occurs rather rarely on the margin of the right elytron in a position corresponding to that occupied by *C. paradoxus,* but nearer to the middle. The broad hooked apex of the perithecium, coupled with the finger-like development of the distal portion of the receptacle, serve at once to distinguish it from known species. The hook-like projection, which arises near the base of the lower appendages, has already been alluded to in the previous description of the genus, and may be the antheridium.

CHITONOMYCES LICHANOPHORUS Thaxter. Plate XXVI, figs. 15–16.

HEIMATOMYCES LICHANOPHORUS: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 32.

Hyaline except for the suffused basal cell. Perithecium bent outward at an angle from the basal part of the receptacle, tapering slightly to the papillate apex. Basal cell of receptacle enlarged and greatly elongated, more or less intensely blackened above its hyaline base; sub-basal cell flat and almost obsolete. Terminal and sub-terminal cells together forming a straight, finger-like projection as long as or longer than the perithecium, on which the appendage is terminal. Spores, 33–37 × 2.5–3 μ. Perithecia, 65–90 × 30 μ. Total length to tip of perithecium, 150–180 μ. Basal cell, 90–110 μ.

On *Laccophilus maculosus* Germ., Connecticut.

This species is confined to the median inferior anal plate of its host, and has only been observed upon males. It is not to be confused with any other species, being distinguished by its elongated basal and apical cells, almost black and white color, and papillate divergent perithecium. *C. rhyncostoma*, which has a very similar finger-like prolongation of the terminal portion of its receptacle, is at once separable by the basal cell, and the form of its perithecium.

CHITONOMYCES UNCINATUS Thaxter. Plate XXVI, fig. 23–24.

HEIMATOMYCES UNCINATUS: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 33.

Evenly suffused with pale amber-brown. Perithecium large, curving evenly inward to the somewhat pointed apex. Basal cells of the receptacle rather slender, the terminal cell pushed to one side and bent past the apex of the perithecium by a somewhat indurated, blunt outgrowth from the sub-terminal cell, the tip of which it nearly equals. Perithecia, 75–85 × 20 μ. Total length, 110–130 μ. Basal cells of receptacle, 37 μ.

On *Laccophilus maculosus* Germ., and *Hydroporus spurius* Lec., Connecticut.

A rather rare species, occurring in groups on the inferior surface of the abdomen of its host, and distinguished by the peculiar development of the sub-terminal cell of the receptacle, which gives its extremity a somewhat hooked appearance.

CHITONOMYCES AFFINIS Thaxter. Plate XXVI, figs. 12–14; Plate VIII, figs. 29–30.

HEIMATOMYCES AFFINIS: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 31.

Rather strongly suffused with amber-brown. Perithecium commonly slightly curved inward, or nearly straight, the tip often slightly bent outward. Basal cell of receptacle large, sub-triangular, suffused laterally and terminally with deep black-brown: sub-basal cell very flat; terminal cell small, its axis bent strongly inward. Spores, 50–55 × 3 μ. Perithecia, 100–110 × 30 μ. Basal and sub-basal cells of receptacle, 40–45 μ. Total length to tip of perithecium, 150–170 μ.

On *Laccophilus maculosus* Germ., and *Hydroporus* sp., Connecticut.

This species occurs near the margin of the right elytron toward its tip, and is distinguished from other species of the more simple forms by its large, blackened basal cell and the position of the terminal cell of the receptacle, which is bent against the perithecium on the left side, and is partly concealed by it when viewed from the right. It is one of the commonest species, and is easily detected from its dark color.

CHITONOMYCES HYALINUS Thaxter. Plate XXVI, figs. 10–11.

HEIMATOMYCES HYALINUS: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 31.

Hyaline or very faintly tinged with yellowish brown. Perithecium large; at first hunched externally and bent inward near the apex; at maturity becoming nearly straight, tapering slightly to the rather narrow apex, which is bent somewhat abruptly outward; one or two oblique ridges more or less distinct below the apex on the inner margin, the walls of the cells composing the outer margin greatly and often very abruptly thickened below the tip. Basal portion of the receptacle rather short and stout, the two lower cells nearly equal. Spores, 30 × 2.5 μ. Perithecia, 75–90 × 20 μ. Total length to tip of perithecium, 110–120 μ.

On *Laccophilus maculosus* Germ., Connecticut.

This species, although it possesses few striking characteristics, is yet quite distinct from any of the others, its chief peculiarity consisting in the fact that the walls of the cells composing the outer margin become abruptly thickened below the tip. The oblique ridges, which are often very distinct below the apex on the inner side, and the abrupt outward curvature of the latter at maturity serve also to separate it from other known species. It is rather rare and detected with some difficulty.

CHITONOMYCES SIMPLEX Thaxter. Plate XXVI, figs. 1–3.

HEIMATOMYCES SIMPLEX: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 30.

Pale yellowish or faintly brownish. Perithecium rather slender, continuing the strong curve of the receptacle evenly outward to its rather coarse blunt straight tip. Basal cell of the receptacle much longer than the flattened sub-basal cell: terminal cell bell-shaped, small, the whole distal portion of the receptacle evenly curved parallel to the perithecium. Spores, 26 × 11 μ. Perithecia, 55–60 × 11–12 μ. Length of receptacle, 75 μ. Basal cell, 15 × 7.5 μ. Total length, 90–100 μ.

On *Laccophilus maculosus* Germ., *Hydroporus spurius* Lec., Connecticut.

A common species, occurring in considerable numbers on the elytra of the host, near the middle of the distal portion, possessing the simple typical structure of the genus, and distinguished by its evenly curved habit, and the prominent blunt almost cylindrical terminal portion of the perithecium.

CHITONOMYCES BIDESSARIUS Thaxter. Plate XXVI, figs. 4–5.

HEIMATOMYCES BIDESSARIUS: Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 185.

Hyaline, becoming faintly tinged with blackish. Perithecium small, stout, its upper third or fifth free from the receptacle, the apex bent outward, the basal portion straight, the tip broad, with large, prominent lips. Receptacle stout, the two basal cells more nearly equal, the two cells above these longer than broad and nearly equal; distal portion nearly as in *C. borealis*, the base of the short terminal cell horizontal. Perithecia, 40–48 × 15 μ. Receptacle, 65 μ long. Total length to tip of perithecium, 80 μ.

On *Bidessus granarius* Aube, Kittery Point, Maine.

This is among the smallest of all the Laboulbeniaceæ, and though presenting no great peculiarities, is distinguished by its stout form as well as the short and very broad but not abruptly distinguished tip. It occurs in various positions on the upper surface of the elytra of its minute host.

CHITONOMYCES BOREALIS Thaxter. Plate XXVI, figs. 8–9.

HEIMATOMYCES BOREALIS: Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 185.

Hyaline or slightly yellowish. Perithecium large and stout, its distal half or more free from the receptacle, tapering slightly to the large blunt apex. Sub-basal cell of the receptacle small and flattened: the distal portion of the receptacle composed of only three cells (the fourth obsolete or very minute), the distal one large, longer than broad, its base very oblique, the two others very long and sub-triangular, the septum between them running obliquely from the insertion of the "trichogyne" nearly to the base of the inner cell. Perithecia, 80–90 × 22 μ. Receptacle, total length, 75–80 μ; length to tip of perithecium, 110–120 μ.

On *Desmopachria convexa* Aube, Kittery Point, Maine, and New Haven, Connecticut.

This species differs from those previously described by the apparent absence of the fourth cell in the distal portion of the receptacle. It is related to the preceding species in its cell arrangement, but is easily separated by its greater size, the relative position and shape of the perithecia, etc. The ascogenic cell faces outward, a position which seems exceptional. It is apparently rare, and occurs in small numbers on the anterior legs of its host.

CHITONOMYCES AURANTIACUS Thaxter. Plate XXVI, figs. 6–7.

HEIMATOMYCES AURANTIACUS: Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 103.

Pale straw-colored, the cell contents including numerous rather bright orange granules or oil globules. Perithecium exceeding the tip of the receptacle by from one-fifth to one-quarter of its length, small, slender, the tip usually curved outward, the lips rather prominent, its external basal cell marked by more or less distinct and very fine transverse ridges. Receptacle slender, the basal cell suffused with brown below, the sub-basal cell small and flat, the two succeeding cells elongate, the outer shorter and continued above by an unusually large basal cell of the perithecium: distal portion of the receptacle, as in *C. borealis*, composed of three cells, the two lower very long and narrow, sub-triangular, obliquely superposed, their lower extremities nearly touching the sub-basal cell. Perithecium, 50 × 14–15 μ. Total length to tip of receptacle, 85–90 μ; to tip of perithecium, 100–110 μ. Greatest breadth, 22 μ.

On *Desmopachria convexa* Aube, Kittery Point, Maine.

A rare species occurring on the right elytron near the middle of its distal half. Distinguished from *C. borealis*, which occurs also very rarely on the same host, and *C. Bidessarius*, by its slender form and orange color as well as the details of its structure. It is a very delicate species, seldom found in good condition. The striation of the outer basal cell of the perithecium is very characteristic, but not always distinct.

HYDRÆOMYCES nov. gen. Plates XXVI and VIII.

Receptacle consisting of a basal and terminal portion, the latter united to the perithecium along its inner margin and terminating in a sub-conical, terminally appendiculate free cell, the cell below the sub-terminal cell producing from its left face three outgrowths, which extend upward, and are separated as cells, ending like the terminal cell in a sub-conical body bearing a single terminal appendage and almost completely concealing the face of the sub-terminal cell: the basal portion consisting of three superposed cells, above which three or perhaps four cells form the base of the perithecium. The wall-cells of the latter arranged in four longitudinal series, each of which contains more than six (eight) cells. Spores fusiform, once-septate.

In view of the invariable character of the fundamental cell structure and arrangement in the sixteen species composing the genus Chitonomyces, to which the single form included by the present genus was first referred, and the very distinct variations from this type presented by the latter, I have concluded to separate it, basing the new genus on the greater number and different arrangement of the small appendiculate cells bearing the lower appendages, the different number of wall-cells in the perithecium and the fact that three of the lower cells of the receptacle are superposed. The genus Chitonomyces, although so closely allied, shows no variation in these respects. The relation of the mature perithecium to the insertion of the trichogyne, and the considerable growth of the former beyond it, recalls the similar relation existent in Ceratomyces, while the same is true to a less degree in Chitonomyces. Although these three genera are all aquatic, it does not seem probable that the similarity just referred to indicates any close relationship with Ceratomyces in view of the very different character of the male organs in either case.

As in Chitonomyces, material has been lacking for a proper study of the younger stages of development, and the character of the trichogyne and antheridium has not been made out. In one specimen the procarpe was distinctly seen, and an attempt was made to represent it in fig. 24, Plate VIII. The trichophoric cell here was large and slightly inflated, lying close beside the inner appendiculate cell. The septation in this figure is somewhat misleading from the fact that it does not represent what is visible in a single plane.

There seem to be at least two if not more ascogenic cells in the mature perithecium, but their structure and early development have not been seen. It is needless to say that both these genera are in a most unsatisfactory condition in so far as concerns their development, and were it not for the discovery of the new genus above mentioned as intermediate between Chitonomyces and Peyritschiella, their position would be entirely uncertain. The single form inhabits species of two genera of aquatic beetles belonging to a family (Haliplidæ) no other members of which are known to be attacked by Laboulbeniaceæ.

HYDRÆOMYCES HALIPLI Thaxter. Plate XXVI, figs. 31–33; Plate VIII, figs. 22–24.

HEIMATOMYCES HALIPLI: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 32.

Strongly suffused with dull amber-brown. Perithecia rather evenly inflated, the extremity evenly rounded, the lip-cells forming a flat, hyaline, abruptly projecting terminal papilla. Basal cell of the receptacle rather long, tapering below, its base suffused with blackish, the two cells superposed above it broader than long, nearly equal: the terminal cell more or less conical, the three lower appendiculate cells nearly as large as the terminal one, and almost completely hiding the sub-terminal cell on the left side. Spores, $30 \times 3\,\mu$. Perithecia, $100 \times 35\text{–}40\,\mu$. Total length to tip of perithecium about $150\,\mu$.

On *Haliplus ruficollis* DeG., and *Cnemidotus muticus* Lec., New Haven, Connecticut, and Kittery Point, Maine.

This species seems by no means common, and is found usually on the right elytron of its host or on the legs. A single specimen only has been found on Cnemidotus.

AMORPHOMYCES Thaxter. Plate V, figs. 17–29.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 158.

Sexual organs borne on separate individuals.

Male individual. Receptacle consisting of two superposed cells, the upper bearing terminally a single simple antheridium.

Female individual. Receptacle consisting of a single cell, above which four (?) small cells form the base of the solitary terminal perithecium. Spores continuous. Asci four spored. Ascogenic cell solitary. Trichogyne a nearly sessile vescicle with short radiate branches.

The above description is based on the characters of the single species *A. Falagriæ*, since it is quite certain that the second supposed species, *A. floridanus*, is generically distinct and not even nearly related to it. The genus is among the most interesting of the whole group, not only from the fact that the sexes are separated on different individuals, but from the peculiarities of its development. It is the only form in which the perithecium is a strictly terminal structure, and, unless it be Dimorphomyces, no other genus has a unicellular receptacle.

The general development of the female is indicated by figures 20–23, the latter showing the first two septa which form in the germinating spore, dividing it into three superposed cells. Of these the lower, which may become partly divided, forms the unicellular receptacle; while of the two others the middle one (*c*) constitutes the primordial cell of the perithecium proper and the upper gives rise to the procarpe.

The development of the male individual is extremely simple. As in the case of the female the spore first divides (fig. 23 at the right) into three superposed cells. Of these three cells the two lower remain unchanged, and may be called the receptacle; although, from analogy with the female, one might infer that the middle cell was morphologically a basal cell of the antheridium. The terminal cell then elongates, producing a long tubular neck through which the antherozoids formed in its basal portion make their escape (fig. 20, at the right).

The spores are unique from the fact that even when fully mature they show no signs of septa; and their contents are exceptional in containing a number of large oil globules (fig. 29). They are always discharged in pairs, the members of which thus develop side by side. It is also an invariable rule, the existence of which has been established by very numerous observations, that, of the members of any such spore pair, one always produces a male and the other a female. Even at the time of discharge there often is observable a slight difference in the size of the two spores (fig. 29), the spore at the left in the figure being somewhat smaller than its fellow. As soon as germination commences (fig. 23) the difference becomes very apparent, and the course of development results which has just been indicated. When the female individual is mature, if care is taken in removing it from its point of attachment, it will always be found that a male individual is attached close to its base, the feet of the two individuals being adherent (fig. 17). A similar juxtaposition of the sexes at the point of growth has already been noted in connection with Dimorphomyces.

The trichogyne bears a striking resemblance to that of the last mentioned genus, and in some instances its radiating branches are furcate, as in fig. 24. The base of the trichogyne, as in the case of Stigmatomyces which has been described in detail elsewhere, is formed from a small cell that becomes separated from the end of the trichophoric cell, and corresponds to the indurated portion of the trichogyne described in connection with Camptomyces. From this cell the receptive portion of the trichogyne first makes its appearance as a minute papilla, which enlarges and grows out to form the characteristic branches just described.

The development of the perithecium proper has not been followed out in all its details, but seems to correspond closely to that described as typical in the first part of this Memoir. Whether there is a stalk-cell and a secondary stalk-cell has not been determined, but it is probable that one of the two may be absent, since there seem to be but four cells about the base of the perithecium.

I have also been unable to observe the first divisions which take place in the carpogenic cell after fertilization, and it is only after the asci have begun to bud from the ascogenic cell that the interior of the perithecium can be seen with sufficient clearness to determine the nature of the changes which are taking place. At this period, however, the ascogenic cell becomes very distinct, and from its large size is a very good subject for observation. Although it is very long and there is sometimes an indication of a septum across it, its development appears to be identical with that of other cases already described. Its period of activity does not seem, despite its unusual size, to be as great as that of most ascogenic cells; and it is in this genus only that one is very apt to find individuals which have apparently died after completing their period of natural activity.

As in Dimorphomyces, instances sometimes occur in which the spores, not having been discharged for some reason, begin to germinate within the perithecium; and specimens like that represented in fig. 19 are not of very rare occurrence, the blackened foot in such instances being conspicuously developed, as well as faint indications of the three primary septa; but no case of almost complete development like that mentioned in Dimorphomyces (fig. 1) has been observed in the present instance.

The affinities of this very important genus are very obscure. From the character of its antheridium it would be placed in a different group from Dimorphomyces, which occurs on the same host and possesses an antheridium of the compound type very highly developed; yet in some respects it seems to approach this genus as closely as any other. The two genera are often found together on the same host, which is a very small beetle belonging to the Staphylinidæ.

AMORPHOMYCES FALAGRIÆ Thaxter. Plate V, figs. 17–29.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 158.

Male individual consisting of three superposed cells, the basal and sub-basal about equal, the latter suffused with dark brown, the suffusion often extending to the adjacent cells; the distal cell an antheridium, basally slightly inflated, distally prolonged into a cylindrical neck bent to one side. Total length, 48 μ by 10 μ broad.

Female individual. Receptacle hyaline, consisting of a small basal cell, sometimes partly divided, surmounted by usually three small cells more or less irregular in shape and position, which form the base of the large pale brownish yellow perithecium, which is curved strongly on the side opposite the ascogenic cell, and tapers to a blunt almost truncate or abruptly lobed tip.

Spores fusiform, aseptate, containing several large oil globules, about 37 × 6 μ. Perithecia, 100 × 30–33 μ. Total length, 130–138 μ.

On *Falagria dissecta* Er., Waverly, Mass., and Kittery Point, Maine.

This species is by no means uncommon on the lower surface of the abdomen, where its large projecting perithecia are readily seen at maturity. It also occurs on the upper surface of the thorax and head and more rarely on the legs and the upper surface of the abdomen. It is subject to little variation, figs. 17 and 18 representing almost the extremes of size; although forms sometimes occur slightly larger than that represented in fig. 17.

AMORPHOMYCES FLORIDANUS Thaxter. Plate V, fig. 30.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 159.

Receptacle consisting of a basal cell, partly divided, from which arises on one side (corresponding to the ascigerous side of the perithecium) a somewhat indurated projection which extends upward nearly to the base of the perithecium. Perithecium very large, externally rounded and tapering considerably to the blunt apex, the basal cells, one of which is as large as the rest of the receptacle, forming a short stalk. Spores once-septate about 30 × 5 μ. Perithecium, 150 × 52 μ. Receptacle (including stalk-cells of perithecium) 62 μ long.

On *Bledius basalis* Lec., Florida.

Two specimens of this species were found on the abdomen of a single specimen of its host in the Le Conte collection of Staphylinidæ. As above stated it is almost certainly not an Amorphomyces; yet since the material is not sufficient to form the basis of a new generic diagnosis in the absence of a knowledge of the male sexual organs, it is here retained under the original name until further information can be obtained concerning it. It differs from Amorphomyces in having what appears to be a two-celled receptacle, the sub-basal cell very small and producing on one side a free projection (seen at the right in fig. 30), which is probably an antheridium; whether simple or compound can hardly be determined definitely; while from the other side rises the stalked perithecium, which is larger in proportion to the remainder of the plant than in any other known form. The spores are distinctly once-septate, as seen within the perithecium, and the large ascogenic cell appears to be solitary.

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HELMINTHOPHANA Peyritsch. Plate VIII, fig. 10 (after Peyritsch).

Sitz. d. Wien. Acad. LXVIII, p. 250 (1873); *Arthrorhynchus* Kolenati, Wiener Entomol. Monatschrift, I (1857), p. 66.

"Ein gestreckter gegliederter, mit spitzigen Fortsätzen versehener Zweig, scheinbar seitlich zwischen 1. und 2. Trägerzelle des Peritheciums inserirt; Perithecium mit einem Bauch- und Halstheil versehen, der Porus desselben wird von einem mehrlappigen Krönchen umgeben." (Peyritsch l. c.)

This genus, of which I have seen no specimens, appears to be clearly separated from the allied Stigmatomyces through the presence of four instead of one vertical row of antheridial cells in its appendage. As far as can be determined from the figures, the appendage and the stalk-cell of the perithecium arise from the sub-basal cell of the receptacle, as in so many other cases. The tip of the perithecium is peculiarly modified in the single species; but more exact information is needed on this point.

HELMINTHOPHANA NYCTERIBIÆ Peyritsch. Plate VIII, fig. 10 (after Peyritsch).

Sitz. d. Wien. Akad. LXVIII, p. 250; Sorokin Veg. Paras. Vol. II, p. 423, Plate XXXII, fig. 759: Winter Die Pilze Deutsch. II, p. 924, p. 920, fig. 3; Berlese, Malpighia, Vol. III, p. 58; Saccardo Sylloge Fung. Vol. VIII, p. 913; *Arthrorhynchus Westrumbii* Kolenati, Wiener Entom. Monatschr. (1857), p. 68; Diesing. Sitz. d. k. Akad. d. Wissensch. Wien, 1859, Vol. XXXVII, p. 752, Plate I, figs. 1–3; *Arthrorhynchus Diesingii* Kolenati, l. c. Diesing l. c. fig. 4.

Perithecium brownish yellow, its basal half slightly inflated, abruptly narrowed to the subcylindrical distal half, the apex composed of two series of small roundish cells, the upper forming four papillate prominences around the pore; the base consisting of four small cells terminating a long nearly cylindrical stalk-cell arising from the very small sub-basal cell of the receptacle. Antheridial appendage arising from the sub-basal cell of the receptacle, its lower half consisting of a single cylindrical stalk-cell, its upper of a single sterile cell above which three superposed cells form an axis from which arise the antheridia in four vertical rows. Receptacle of two cells, the basal roundish without any blackened foot. Total length to tip of perithecium, 390–750 μ.

On *Megistopoda Westwoodii* Kol., *Acrocholidia Montaguei* Kol., *Nycteribia Dufourii*, Middle Europe.

The two species described by Kolenati under the genus Arthrorhynchus are said by Peyritsch to be identical, although since they occur on generically distinct hosts it is not impossible that they may prove to be different. The original descriptions being based on supposed zoölogical characters, are quite unintelligible; while the figures of Diesing, apparently drawn from dry material, give no clue to any specific differences.

The hosts are wingless, dipterous parasites of bats, of which I have examined several American specimens, on which no Laboulbeniæ were to be found.

II. p.301

STIGMATOMYCES Karsten. Plate VIII, figs. 1–9; Plate I, figs. 1–26.

Chemismus der Pflanzenzelle, p. 78, Wien, 1869.

Receptacle consisting of two superposed cells, the upper giving rise to the single perithecium on one side and to the single appendage on the other. The perithecium various in form, stalked or sessile, sometimes appendiculate. Appendage consisting of an axis of superposed cells from which are developed on one side a single row of superposed antheridia separated from them by a septum or by a small cell. The antheridial cells flask-shaped, the venters more or less united, the necks projecting independently. Trichogyne simple, short, filamentous. Spores once septate.

This genus, although the three species that it contains are very diverse in form and appearance, is yet clearly characterized by the structure of its antheridial appendage; the latter being unlike that of any other genus with the exception of Idiomyces, which it only remotely resembles. As will be seen by examining the figures on Plate I, the appendage is formed from the terminal segment of the germinating spore, its basal cell only (figs. 6 and 10 *b*) being derived from the basal spore segment. The process by which the terminal segment becomes septate (fig. 3), and by which the antheridial cells are separated from the cells thus formed, is clearly shown by the series of figures (3–9); and, as will be noted, the antherozoids begin to make their escape some time before the female organ has developed. The origin and development of the procarpe has already been described in detail (p. 218), and further reference to it is unnecessary here.

The mature perithecium varies very considerably in the different species. Not only is its form variable, being rostrate in *S. entomophilus*, clavate in *S. virescens*, and conical in *S. Baeri;* but the relative position of its wall-cells is not the same in either case. *S. virescens* is remarkable from the fact that the position usually assumed by the basal wall-cells is taken by the basal cells of the perithecium, which extend up around the ascogenic cell and some distance above it (fig. 2). The perithecium of this form is moreover peculiar by reason of the appendages which are developed from its lip-cells. According to Karsten, two perithecia are sometimes formed in the same individual of *S. Baeri;* but I have not myself seen such an instance, and it is undoubtedly an abnormal occurrence. In all the species there are four cells in each of the series of wall-cells, although in *S. virescens*, for the reason just mentioned, there appear to be five. The ascogenic cells are four in number in *S. entomophilus* and *S. Baeri;* but in *S. virescens* there seems to be but one; certainly not more than two.

In exceptional instances, in which the female organ has not developed, the cells of the appendage, which would ordinarily have been converted into antheridial cells, may grow out into short secondary appendages, thus, as in other similar instances, greatly increasing the number of antheridial cells. This occurs very rarely in *S. Baeri*, but in *S. virescens* does not appear to be uncommon.

In *S. virescens* the stalk-cell of the perithecium is well developed, but in the other two it is the reverse, so that the latter is nearly or quite sessile. The hosts of the genus belong to the Diptera and Coleoptera.

Stigmatomyces Baeri Peyritsch. Plate VIII, fig. 9 (after Peyritsch); Plate I, figs. 1–26.

Sitz. d. Wien. Akad. Vol. LXVIII, p. 250 (1873); Berlese, Malpighia, Vol. III, p. 57; Winter Pilze Deutsch. Vol. II, p. 923, p. 920, fig. 2; Sorokin, Animal Parasites, Vol. II, p. 418, Plate XXXIII, fig. 788; *Laboulbenia Baeri* Knoch Assembl. d. Natural. d. Russie à St. Pétersb. p. 908 (1867); *Stigmatomyces muscæ* Karsten Chemismus d. Pflanzenzelle (1869), p. 78, fig. IX; Deutsche Flora (1880), p. 123; (1895) p. 119; Hedwigia, Vol. XXVII, p. 137, p. 138, fig. 3; Saccardo Sylloge, Vol. VIII, p. 913; *Laboulbenia muscæ* Peyritsch l. c. Vol. LXIV, p. 444, Plate I; *Laboulbenia Pitræana* Sorokin, Mykologische Versuche, Charkow, 1871, p. 39, Plate IV, figs. 1–9; Bot. Zeitung (1872), p. 339.

Perithecium brownish yellow, its lower half sub-cylindrical stout, somewhat abruptly distinguished from the sub-conical terminal portion; the tip slightly pointed and incurved, the cell rows spirally twisted. The appendage borne on a distinct free basal cell, curved, consisting of five or six obliquely superposed series of cells, the outer cell (antheridium) of each series projecting free from the one or two cells below its base, which may be partly united with the venters of adjacent antheridia. Receptacle consisting of a sub-cylindrical basal and sub-basal cell; the foot rather small and blackened. Total length to tip of perithecium, 230–400 μ (Peyritsch). Perithecium, 140–180 × 40–58 μ. Appendage about 85 μ. Spores, 27–30 × 4 μ.

On *Musca domestica* L., Europe.

I am indebted to Miss Helen Bondy, of Vienna, for material of this interesting form, which I found sufficiently abundant on house flies, of which she was kind enough to send me a large collection. The parasites were attached to all parts of the host, but as a rule were more commonly found on the back of the head and thorax and near the base of the anterior pair of legs and the adjacent portions of the body. Although there seems to be a tendency in the case of female flies to bear the parasite on the upper, and of males to bear it on the lower side, as a result of transference during *coitus*, I have found this condition by no means invariable as stated by Peyritsch. The original account given by Karsten appears to be distinctly more correct than that of Peyritsch; since he not only saw and figured the trichogyne with antherozoids attached, but noted the twisting of the wall-cells of the perithecium, which seems to have been overlooked by the latter observer.

The figure of a mature specimen (Plate VIII, fig. 9) was reproduced from Peyritsch before the material mentioned was obtained; but is sufficiently good for purposes of identification. I have searched for the species in several localities in this country without success; but even if it is not indigenous, it is very improbable that it does not occur here in view of the habits of its host, large numbers of which are being constantly imported from Europe on vessels.

I have not seen the original paper of Knoch in which the species was first described; yet if the title given by Peyritsch is correct, "Laboulbenia Baeri Knoch, einer neuer Pilz auf Fliegen," one cannot agree with the conclusions of Karsten (Hedwigia l. c.) by which the name *Stigmatomyces Muscæ* Karsten is retained.

STIGMATOMYCES ENTOMOPHILUS Thaxter. Plate VIII, figs. 5–8.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 8; *Appendicularia entomophila* Peck, 38th Report (1885), p. 95, Plate III, figs. 1–4; Berlese and Voglino in Saccardo, Sylloge Fungorum, Additamenta ad Vols. I–IV, p. 354; *Appendiculina entomophila* Berlese, Malpighia, Vol. III, p. 59, Plate II, figs. 1–5; Saccardo Sylloge, Vol. VIII, p. 914. See also Gerke: Wiener Entomol. Zeitung, V, p. 168; Taf. II, fig. 14 (1886).

Perithecium consisting of an ovoid, pale amber-brown base, abruptly narrowed above to form the greatly elongated sub-cylindrical, beak-like, nearly hyaline distal portion. Receptacle tinged with yellowish, long and slender, consisting of a basal and greatly elongated sub-basal cell, followed by two cells, a posterior longer and narrower, which bears the appendage, and an anterior (stalk-cell), separated from the perithecium by four small cells. Appendage small, consisting of a more or less rounded basal cell, bearing the usual series of cells, the venters of the successive antheridial cells more or less completely united, the necks papillate, not very prominent. Spores, 40 × 3.7 μ. Perithecium, 275–300 μ long, its base about 90 × 60 μ, its terminal beak about 195 × 18 μ. Receptacle, 300–325 × 30 μ. Appendage about 55 μ long.

On *Drosophila nigricornis* Loew., Nyack, New York (J. L. Zabriskie). On *D. funebris* F., Europe (G. Gerke).

I am greatly indebted to its discoverer for several preparations of this curious form, which was originally collected by him on small flies found in a cellar during the month of March. The species is chiefly remarkable for the great elongation of the sub-basal wall-cells of the perithecium, which form almost the whole of its slender, beak-like, terminal portion. Professor

Giard has kindly called to my notice a reference by Gerke in the Wiener Entomologische Zeitung to a parasite on *Drosophila funebris*, found by him in June, 1877. Though his figure is somewhat insufficient, it is more than probable that the plant which he describes is identical with the present species. The figures are evidently drawn from dried and shrivelled specimens, and no appendage is visible, although otherwise they correspond essentially with the American form.

Professor Peck, in his original description, represents the spores as divided by a median septum, but in the material examined they appear to be of the usual type as represented in fig. 8. The host occurs in cellars and similar situations, where it is commonly found hovering over decaying fruit, etc.

STIGMATOMYCES VIRESCENS Thaxter. Plate VIII, figs. 1–4.

Proc. Am. Acad. Arts and Sci. Vol. XIX, p. 106; *Hesperomyces virescens* Thaxter, l. c. Vol. XXIV, p. 264.

Color yellowish green. Perithecium large, clavate or sub-clavate, constricted more or less prominently at the transverse septa between its successive wall-cells, straight on the inner side, rounded externally; the distal series of wall-cells forming the tip, the small terminal cells thus formed producing from four to eight appendages; the outer short or obsolete, the inner consisting of two antero-posterior wedge-shaped prominences, between which lies the pore; and two much longer, divergent, tapering, sometimes septate, lateral appendages. The ascogenic cell perhaps solitary (?), becoming pushed down between the proper basal cells of the perithecium, which thus appears to have five sets of wall-cells. Appendage abruptly constricted at its base, the antheridial cells, usually five in number, distinct, except at the base. Receptacle sharply pointed below, small, sub-triangular, consisting of a basal cell and two smaller terminal cells, the posterior smaller bearing the appendage, the anterior the stalk cell of the perithecium, which equals or exceeds the main body of the receptacle in size. Spores, 65 × 6 μ. Perithecia, 190–275 × 66 μ; its longer terminal appendages, 40–45 μ. Receptacle, 75 × 30 μ. Antheridial appendage, 75 × 13 μ. Total length to tip of perithecium, 300–400 μ.

On *Chilocorus bivulnerus* Muls., California.

I am greatly indebted to Mr. D. W. Coquillet for two specimens of the above host taken at Los Angeles, which bear the parasite on the legs and on the lower surface of the abdomen; where, owing to its large size and contrasting color, it is readily seen with the naked eye. A further knowledge of the family shows that the characters relied upon for distinguishing the genus Hesperomyces have merely a specific significance; and that while the number of wall-cells of the perithecium appears to be greater than in the other species of Stigmatomyces, they are in reality the same, as indicated in the above description. The receptacle, moreover, may without difficulty be reduced to the same type, although from the obliquity of the septa and somewhat different relative position of its cells, the insertion of the appendage might at first sight seem abnormal. The spores sometimes present a peculiar appearance, through a local inflation of their smaller segment.

II. p. 314

IDIOMYCES Thaxter. Plate IX, figs. 16–21.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 162.

Receptacle consisting of two superposed cells, followed by two cells, an anterior and a posterior, — the posterior cell followed by a vertical series of superposed cells bearing externally fertile and sterile appendages in three vertical rows; the anterior cell producing one or more stalked perithecia and numerous fertile appendages arising from small cells separated from it distally. Perithecia symmetrical with four ascogenic cells. Fertile appendages consisting of a single series of superposed cells, bearing on one side three vertical rows of flask-shaped antheridial cells. Spores once-septate.

This genus is nearly related to Stigmatomyces, through the structure of its peculiar appendages, which are very similar, except for the presence of three instead of one row of antheridial cells. Viewed laterally (fig. 18), it is not possible to determine the number of rows; but a face view, such as is shown in fig. 19, shows the slender necks of the three antheridial cells projecting side by side at regular intervals. The sterile appendages (fig. 20) consist also of a series of superposed cells, each producing a single sterile lateral branch.

The receptacle is somewhat complicated in structure, consisting of four cells arranged as above described, the peculiarly differentiated posterior series of superposed cells, which bear the appendages externally, recalling, in a way, the primary appendage of Ceratomyces. The cell which produces the perithecia becomes distally divided, usually on one side only, the cells thus formed producing the second set of appendages, which, in well developed specimens, may be very numerous and extend almost completely around the base of the stalk-cell of the perithecium on both sides. Fresh material for a more minute examination of this genus is greatly to be desired, since the specimens of the single species which constitute the types are in very poor condition, with the exception of the one from which fig. 17 was derived.

IDIOMYCES PEYRITSCHII Thaxter. Plate IX, figs. 16–21.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 162.

More or less tinged with yellowish or amber brown. Receptacle consisting of two superposed basal cells, surmounted by two cells; the outer, having a very thick external wall which forms a distinct prominence distally, is succeeded by a row of about five or six superposed, more or less flattened cells, extending beyond the base of the stalk-cell of the perithecium, which bear externally three vertical series of closely-set appendages: the inner is succeeded by a single rounded cell followed by several small cells, which give rise to a series of similar appendages variable in number. Appendages mostly fertile, borne on one or two squarish basal cells, terminated by a simple or once branched short sterile filament. Perithecia short, thick, subconical, the apex sub-truncate, the base inflated, borne on a long stalk made up of a single basal and two sub-basal cells, the outer directly in contact with the perithecium, the inner separated from it by two small cells. Spores, 60 × 4 μ. Perithecia, 110–130 × 60–70 μ. Appendages longer, 80 μ. Receptacle, 130–165 × 70–95 μ. Stalk of perithecium, longest, 200 μ.

On *Deleaster dichrous* Grav., Germany.

The types of this species were found on the upper surface of the abdomen of its curious host, among specimens of the latter contained in the Museum collection at Cambridge. The dozen types obtained show a considerable variation in the number and position of the appendages at the base of the stalk-cells of the perithecium. The latter appear to arise always from the same cell, whether the individual produces one perithecium or more than one. In a single instance three perithecia are developed, while a majority appear to have two. The few specimens accessible of the only American Delcaster were examined carefully, in the hopes of finding a similar parasite, but without success.

CORETHROMYCES Thaxter. Plate IX, figs. 1–6. II. p. 318

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 36, and XXVIII, p. 180.

Receptacle consisting of several superposed cells, the sub-basal cell and rarely also the cell above it producing a stalked perithecium, the terminal cells giving rise to several branched appendages. Antheridial cells superposed to form an obliquely septate branchlet with projecting necks. Perithecium symmetrical or nearly so, the stalk-cell well developed; its cell-rows of four cells each. Spores once-septate. Trichogyne filamentous, simple or branched.

The material on which the original description of this genus is based was so insufficient that it has been necessary essentially to modify the present diagnosis in the light of more abundant data subsequently obtained. It approaches Rhadinomyces more closely than any other genus, especially in the character of its antheridia, and may eventually have to be united with it. In all three species, however, a cell is present above the sub-basal cell of the receptacle, which is either sterile or produces a second perithecium, while in Rhadinomyces the secondary perithecia, which are very commonly developed, arise invariably from the sub-basal cell of the receptacle. There are other differences in general habit, character of the appendages, and details of structure in the antheridial branchlets, which, though of less importance, all tend to make it seem advisable to keep these genera distinct until further data concerning them can be obtained.

In development the spore first divides into five superposed cells. The terminal one by successive proliferation from one side, produces a tuft of terminal branches and branchlets, which are often broken or obsolete in older individuals. The sub-basal cell produces a single perithecium, which first appears as a triangular cell cut off from its anterior upper portion, as in Laboulbenia. The cell above this either remains unchanged or produces a second perithecium, while the sub-terminal cell gives rise to the main appendages. The antheridia arise as branchlets from the main appendages, the terminal cells of which are sterile. The trichogyne is well developed, slender, septate, and more or less branched.

The three species are found on beetles belonging to the Staphylinidiæ, and inhabiting very wet situations, especially along the margins of streams or ponds.

CORETHROMYCES CRYPTOBII Thaxter. Plate VII, figs. 1–2.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 36, and XXVIII, p. 181.

Perithecium usually very long and slender, becoming uniformly suffused with brown; straight, slightly inflated toward its base, tapering very gradually to its blunt symmetrical apex;

its stalk-cell hyaline, blackened at its base, two or three times as long as broad, its basal cells not abruptly distinguished, and concolorous with it; the inner as long as the stalk-cell. Receptacle short, narrowed below, the basal cell small, hyaline or brown and translucent, the rest black, opaque. Terminal appendages short, usually broken or obsolete, the main (lateral) appendages primarily two in number: an upper simple, a lower furcate near its base, each consisting of a main more or less obliquely septate axis, from which numerous obliquely septate more or less appressed branches are produced externally, which may themselves produce simple branchlets; the branches externally opaque. Spores, 40 × 4 μ. Perithecia, including basal cells, 415 × 50–130 × 33 μ. Average, 290 μ long; the stalk-cell, 37–95 μ long. Appendages, 130–536 μ long. Total length to tip of perithecium, 600–200 μ.

On *Cryptobium pallipes* Grav., and *C. bicolor* Grav., Virginia, Pennsylvania, Kansas.

The type of this fine species was found on the leg of a specimen of *C. pallipes* sent me from Virginia by Mr. Pergande, and a small number of examples was subsequently found on a specimen of *C. bicolor* in the Museum collection. More recently a large number of both these hosts, sent me from Kansas by Mr. M. A. Barber, have yielded abundant material, and it is much to be regretted that the figures given on Plate IX. should not have been drawn from these perfect and well developed specimens. The species varies very greatly in size, as may be inferred from the above measurements, as well as in the relative length of its different parts. In perfectly developed specimens the appendages often slightly exceed the tip of the perithecium. There is a good deal of variation in the number and length of the branchlets, more than one commonly arising from each cell of the main axis, which, though straight and rigid, appear to be formed as a result of successive sympodial branching. Specimens occurring on the abdomen of the host are commonly far larger than those which are attached to the legs. In general appearance the species recalls in some respects the remarkable East Indian *Laboulbenia palmella* (Plate XVIII, fig. 11), but the resemblance is wholly superficial. The hosts above mentioned are large and conspicuous Staphylinid beetles, common under stones and in wet rubbish along the margins of streams and ponds.

Corethromyces jacobinus Thaxter. Plate IX, figs. 3–5.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 181.

Perithecium hyaline, becoming faintly brownish, rather short, somewhat inflated, tapering to a blunt apex. Receptacle short, the basal cell small, hyaline; partly, sometimes wholly, black and opaque. Appendages arising in a fan-like tuft, the two or three main axes usually short, formed by sympodial branching; the branchlets once or twice branched, much longer, the outer becoming brown, the inner mostly hyaline. Perithecia, 65–75 × 22 μ. Appendages about 160–200 μ long. Total length to tip of perithecium about 150 μ.

On *Lathrobium jacobinum* Lec., California; on *L. collare* Er., Kittery Point, Maine; on *Lathrobium* sp., Arlington, Mass.

This small species varies very greatly in luxuriance; figures 3 and 4 representing more or less extreme cases, between which every degree of development may be seen. In a few instances two perithecia are formed, one above the other, as already described. The form, though so widely distributed, is apparently a rare one, and abundant material is needed for its further study. The hosts on which it occurs were taken under stones and in moss at the borders of ponds.

Corethromyces setigerus Thaxter. Plate IX, fig. 6.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 181.

Perithecium becoming tinged with brown, slightly inflated and tapering to the blunt apex; stalk-cell hyaline, long. Appendages arising from the distal and sub-distal cells of the receptacle, consisting of two or three rounded basal cells, which bear numerous long, straight, cylindrical, septate, deep brown branches, some of them once branched, the whole curved slightly outward and forming a crest-like structure. Basal cell of receptacle hyaline, the rest, including the two appendage-bearing cells, strongly blackened externally. Perithecia, 110 × 35 μ. Spores (measured in perithecium), 30 × 4 μ. Total length of appendages, 200 μ or more. Two basal cells of receptacle, 35 × 15 μ. Total length from base to tip of perithecium, 200–220 μ.

On thorax of *Lathrobium nitidulum* Lec., Massachusetts; on *L. tenue* Lec., Michigan.

This species is closely allied to the preceding, yet seems sufficiently well marked to keep distinct. Its appendages are quite characteristic, recalling those of *Laboulbenia cristata.* The main axes seem almost obsolete, being reduced to several rounded cells, which form a group, from which arise the long, rigid, brown branches. The stalk-cells and lower basal cells of the perithecium are much larger than in *C. jacobinus*, as is the perithecium itself. The material examined was all obtained from specimens in the Museum at Cambridge, and is not in very good condition.

RHADINOMYCES Thaxter. Plate IX, figs. 7–15. II. p. 317

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 179.

Receptacle consisting of two superposed cells, from the upper of which arise one to several stalked perithecia and a main appendage; the appendage consisting of three superposed cells, the upper bearing terminally a series of simple sterile branches, the two lower producing from their distal ends short antheridial branches or long sterile branches or both. Antheridial cells flask-shaped, superposed in short series. Perithecia borne on a single stalk cell followed by four basal cells; its wall-cells four in each series. Spores once-septate. Trichogyne filamentous, simple or branched. Ascogenic cells, four.

In some instances the sub-basal cell of the receptacle may produce one or more antheridial branchlets directly, in addition to those on the main appendage. The antheridial cells are sometimes single, more often superposed in threes, the upper one being free and terminal. A few specimens have been observed in which the antheridial branchlets, instead of being borne directly from the primary appendage, as in fig. 12, arise from some of its ordinarily sterile branches.

The ascogenic cells are readily made out in the paler species, and at maturity four may be usually distinguished; but this number does not seem to be constant even in the same species. In a few instances a peculiar spine, present also in other genera, has been observed near the base of the primary sterile branch (fig. 22) in *R. cristatus;* but its significance is undetermined.

As has been previously mentioned, it may eventually prove necessary to unite this genus with Corethromyces.

RHADINOMYCES PALLIDUS. Plate IX, figs. 7–9.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 180.

Hyaline or slightly yellowish. Perithecium becoming pale amber brown, except the tip, which is colorless; more or less inflated, conical above, the apex blunt symmetrical, the stalk-cell about as long as the receptacle. Receptacle small, the basal cell somewhat larger than the sub-basal. Appendage of three nearly equal cells, the distal bearing terminally from one to three sterile, simple, tapering flexuous branches; the other two producing distally groups of antheridial branchlets arising from small cells cut off from their upper inner angles. Spores, 45 × 3.7 μ. Perithecia, 86 × 33 μ. Primary appendage about 60 μ, its longer branches 225–375 μ. Total length to tip of perithecium, average 200 μ.

On *Lathrobium punctulatum* Lec., and *L. angulare* Lec., vicinity of Cambridge, Mass., and Kittery Point, Maine.

Var. a. Plate IX, fig. 10–11. Larger than the type, the perithecia proportionately narrower, becoming evenly suffused with amber yellow. Appendage often relatively shorter with numerous sterile branches arising from all its cells, often crowded, and usually producing short antheridial branchlets. Perithecia, larger, 165 × 45 μ. Spores, 44 × 4 μ. Appendage, 37–150 μ; its longest branches about 300 μ. Total length to tip of perithecium (larger), 425 μ.

Occurring with the type on *L. punctulatum* Lec.; on *L. fulvipenne* Grav., Germany.

As a matter of convenience I have separated from the type, which is on the whole moderately constant, a series of larger forms often occurring with it and approaching *L. cristatus* in some respects. While in the type the size is small, the perithecia pale amber brown with hyaline tips at maturity, the branches of the appendage few in number, with the antheridia borne in the typical fashion directly from the main appendage; in the variety very considerable differences in size and general habit are noticeable. While in the type two perithecia are unusual, in the variety there are sometimes five, uniformly tinged with amber yellow; the appendage is apt to be much more copiously branched, and though this is not always the case, it is often decidedly shortened, with a corresponding increase in the luxuriance of its branches. In the European specimens the appendage is more normal in form and much like that of *R. cristatus*, which in the end may prove a mere variety. It is also distinctly larger even than the ordinary American forms of the variety, but cannot be separated specifically.

RHADINOMYCES CRISTATUS Thaxter. Plate IX, figs. 12–15, 22–23.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 180.

Perithecia one to four, hyaline, becoming yellowish or pale brownish, the stalk-cell as long as or considerably longer than the perithecium proper. Appendage large, the terminal cell bearing distally a series of from two to six (usually four) long, stiff, cylindrical, septate, dark red brown simple branches, arising side by side antero-posteriorly; the middle cell usually bears a single similar sterile branch arising from a small cell cut off from its upper inner angle, and also sometimes producing an antheridial branchlet; the basal cell has two cells similarly cut off from its distal end on either side, each producing antheridial branchlets. Spores, 50 × 4 μ. Perithecia, 125–140 × 30 μ; the stalk-cell, 75–170 μ. Main appendage, 110–185 × 18 μ; its longest branches, 750 μ.

On *Lathrobium nitidulum* Lec., and *L. punctulatum* Lec., Cambridge, Mass., and Kittery Point, Maine.

This striking form does not appear to vary to any great extent even on the two hosts above mentioned, and well developed specimens correspond closely to the type figured on Plate IX (fig. 12). The long, brown, rigid branches of its appendages are perhaps the most striking apparent difference which distinguishes it from *R. pallidus;* but although with only the type of *R. pallidus* before him (figs. 7–8), one would hardly hesitate in separating the two species, the European material and some of the varietal forms of this species render it not altogether certain that the present form is distinct. The fact, however, that *R. pallidus* occurs on the same host (*L. punctulatum*) in the same position and in its typical form, and that no tendency to variation toward *R. pallidus* is visible in the abundant material of *R. cristatus*, derived from several specimens of this host on which it was found at Kittery, indicates that at least these differences are not variations due to the position of growth or the character of the host.

The hosts affected were collected in considerable numbers about wet bogs or beside ponds; but the species seem very rare.

RHIZOMYCES nov. gen. Plates III–IV. II. p. 322

Receptacle consisting of two cells, the lower (often) with rhizoid-like outgrowths from its base which penetrate the body cavity of the host. Perithecia solitary, borne on a stalk-cell arising from the sub-basal cell. Antheridial appendages consisting of numerous superposed cells all of which, except the lowest, produce externally antheridial branches, their basal cells bearing simple antheridia of the usual flask-shaped type.

This genus is clearly distinguished from all others by the structure of its strikingly peculiar appendage. The antheridia, however, are exactly like those of Laboulbenia, although the appendage in other respects differs fundamentally from that which is found in the genus just mentioned. It seems only remotely allied to any of the known genera, and is unique in that it produces from its basal cell well developed, semi-filamentous branching rhizoids (Plate IV, fig. 3), which penetrate the body cavity of the host, the softer chitinous integument of which it inhabits. The main axis of the appendage appears to result from successive sympodial branching, each cell representing the base of a sympodial branch, on which the corresponding antheridial branch was at first terminal. From the fact that the types are all mature individuals, the early stages of development were not seen; yet it seems improbable that they present any great peculiarities, unless perhaps as regards the trichogyne. In the type species the position of the ascogenic cells, of which there are two lying side by side in the mature perithecium, is unusual, the long axis being turned at a considerable angle to that of the perithecium, instead of coinciding with it, as is usually the case; so that all the younger asci are seen pointing outward and downward (Plate III, fig. 3). The spores are unusually minute in proportion to the size of the perithecium, and it is possible that the asci may be eight-spored. Seen within the perithecium, however, they seem to be four-spored.

RHIZOMYCES CTENOPHORUS nov. sp. Plate III, fig. 3; Plate IV, figs. 1–4.

Perithecium, including its basal cells, dark amber brown, asymmetrical, the lower half somewhat inflated, the rather truncate tip not distinguished from the tapering, neck-like, slightly bent upper half; the sub-terminal wall-cells marked by fine transverse striations; the lower half not distinguished from the basal cells, which are themselves abruptly distinguished from the long, slender, cylindrical stalk-cell. The basal cell of the receptacle rounded below, about half as large as the sub-basal, the rhizoids rather copiously and irregularly branched or lobed, colorless. Appendage shorter than the stalk-cell of the perithecium; the axis simple or exceptionally furcate near the base, consisting usually of about thirteen superposed cells; the basal cell small, blackened and somewhat constricted; the rest producing antheridial branches always on the same side, forming a unilateral series; the branches in turn several times more or less sympodially branched; the branchlets distally somewhat indurated and suffused with blackish brown, the whole forming a comb-like tuft; the ultimate branchlets curved outward and downward. Antheridia long, flask-shaped, sessile, borne rather irregularly, one to four together, from the upper surface of the basal cell of the antheridial branch; sometimes also from the sub-basal cell. Spores, 25 × 3 μ. Perithecium, including basal cells, 180–200 × 62–70 μ; smallest, 120 × 35 μ; the stalk-cell, 275–620 × 35 μ; average, 550 μ long. Appendage, longer, 325–340 μ; greatest diameter of axis, 17 μ; antheridial branches, longer, 45–50 μ. Receptacle, 60 × 45 μ. Rhizoids, longer, 86 × 13 μ. Total length to tip of perithecium, longer, 800–880.

On *Diopsis thoracica* Westw., Coffee Hill, Liberia (O. F. Cooke) and Zanzibar.

This fine species was found growing in a tuft on the soft chitin of the lower surface of the abdomen of its peculiar host, and although it is difficult to detach the plant without breaking its rhizoids, a few specimens were obtained which show them little injured, and with portions of the host's integument still adherent about the constriction which separates them from the basal cell of the receptacle. The appendage is among the most striking in the group, and from the flat, uniseriate arrangement of the sterile branchlets from the antheridial branches, bears a certain resemblance to a large comb or series of small combs. The branches which arise at or near the extremity of the appendage are usually wholly sterile, and in the fertile ones there is little regularity in the number of antheridia. The striation of the sub-terminal wall-cells of the perithecium seems to be a constant and peculiar character; but is not so conspicuous that it might not be readily overlooked.

II. p.328

LABOULBENIA Montagne and Robin (1853). Plates I–IV, XIII–XXII.

Receptacle consisting typically of seven cells, exclusive of three small cells which form the base of the perithecium; the two lower (cells I and II) superposed and forming the receptacle proper; the cells above them arranged in an anterior and posterior series, the latter consisting of two cells, a lower (cell II) and an upper (cell IV), the inner upper portion of which is separated as a third cell (cell V, which is in reality made up of two cells placed side by side), the former consisting of a lower (cell VI) and an upper (cell VII) obliquely superposed. Appendages arising from a blackened insertion cell above cells IV and V (exceptionally from a variable number of subdivisions of these cells, in which case the black insertion cell is wanting). Perithecium solitary, compressed, asymmetrical or nearly symmetrical, rarely appendiculate, sessile or stalked, having four wall-cells in each longitudinal row. Appendages sometimes numerous, but typically consisting of two basal cells, from the outer of which arises one, from the inner two branches or series of branches, the inner fertile bearing the flask-shaped antheridia, singly or more or less irregularly grouped. Ascogenic cells two, lateral. Asci four-spored. Spores once septate. Trichogyne filamentous, simple or branched.

Owing to the occurrence of several exceptional modifications in the structure of certain members of this genus, it is very difficult to characterize it briefly and concisely; and owing to the fact that it contains nearly half of all the members of the family, its variations are, as might be expected, very considerable. The more striking departures from what may be considered the type form, are illustrated by the following species: *L. Gyrinidarum*, *L. Guerinii*, *L. Orectogyri*, *L. Oberthuri*, *L. variabilis*, *L. brachiata*, *L. fasciculata*, and to a less extent by *L. proliferans* (Plates XXI and XXII), in all of which the usual black insertion cell is absent or modified, while cells IV and V have undergone division above into a series of cells differently arranged in different cases, all of which may give rise to appendages. A further abnormal septation of these two cells of a somewhat different character is seen in *L. Clivinæ* (Plate XXI, figs. 16–17), a species otherwise peculiar for the coalescence of its appendages at the base. Typically the black insertion cell bears above it two cells, an outer forming the base of a single simple or branched sterile appendage; the inner giving rise on either side to a branch which is fertile and may be variously divided. The complications of this simple type are, however, numerous and often very striking, resulting either from the sub-division of one or of both of these basal cells, and the production from them of more numerous branches; or from a combination of both these modifications. Such variations are well illustrated by species like *L. Brachini*, *L. luxurians*, *L. minima*, *L. zanzibarina* or *L. Galeritæ*.

A second departure from the type form is illustrated by such species as *L. Kunkeli*, *L. longicollis*, *L. Galeritæ* and their allies (Plates XVIII and XIX), in which the lower cells in each of the four series of wall-cells of the perithecium become greatly elongated, forming a well defined stalk on which the latter appears to be borne.

The perithecium is also subject to considerable variation in form, especially as regards the modifications of its lip-cells. In two cases the latter are appendiculate (*L. Gyrinidarum* and *L. cornuta*); while in others they are curiously expanded (*L. umbonata*, *L. texana*, etc.) or irregular. The four rows of wall-cells may sometimes show a distinct spiral twist, as in *L. arcuata*, *L. decipiens* (Plates XVIII and XX) and a few other forms, and are composed of four cells each; although, except in younger specimens, the usual blackening below the pore obscures the upper septa.

The trichogyne, although it is sometimes merely a simple, sparingly septate filament, is more commonly, often very copiously branched, the receptive tips being either straight (Plate II, fig. 3), or in many instances spirally twisted (Plate XXI, fig. 15). The antheridia are generally very uniform, but vary greatly in their numbers, being sometimes solitary or nearly so, as in *Laboulbenia Pachytelis*, or produced in great numbers, as in *L. Brachini* and several others. Their arrangement on the antheridial branchlets may be characteristic; for while as a rule they are apt to be solitary, in species like *L. variabilis* (Plate XXI, fig. 3), or *L. proliferans* (Plate XVII, fig. 23), they are more or less definitely grouped.

The homologies of the "receptacle" are evidently such as have been previously described (p. 206), the cells above cell II (Plate II. fig. 5) representing the union of the stalk-cells of the perithecium (cells VI and VII; *h* and *p* of the figure), with the base of the appendage (cells III to V), the latter (cell V) being, as may be seen when they have been separated by potash, in reality a pair of cells placed side by side and appearing like one. The bodies spoken of as the "appendages" in this genus are therefore morphologically only the branches of a main appendage.

With the few exceptions above mentioned, the type structure of the individuals which compose the genus is remarkably constant and very clearly defined; so that little difficulty will be experienced in distinguishing it from all others. Its immediate connections with other genera are not, however, clear, and its nearest ally is difficult to designate.

The aquatic forms already enumerated might perhaps be separated in a genus by themselves, were it not for the fact that their chief peculiarity, namely, the origin of their appendages, is almost exactly paralleled by *L. variabilis*, which can by no possibility be excluded from Laboulbenia. Unless other more important points of difference should appear, it is impossible thus to separate them. It may, however, be remarked in passing that *L. Gyrinidarum* is one of the very few species in which the character of the antheridia has not yet been satisfactorily made out, although the trichogyne is highly developed.

In the following descriptions the black cell from which the appendages arise is spoken of as the "insertion-cell," the cells of the receptacle being numbered (I to VI), as in fig. 5, Plate II, and the side bearing the perithecium is considered anterior. The species are sometimes cosmopolitan, and are very numerous and varied, inhabiting a great variety of hosts, including Coleoptera, Diptera, Neuroptera and the Acarini. Many of the forms of what I have called the "*flagellata*" type are very variable, and given species may inhabit hosts of many species and even genera. Specific determinations are thus often difficult, and in the group of species represented by *L. flagellata*, *L. anceps*, *L. elongata*, *L. Peterostichi*, *L. polyphaga*, there is much uncertainty in regard to the identities of many of the varieties. The synonymy in these cases is also confused, and some names may have to be discarded.

Laboulbenia Rougetii Mont. et Robin.

Robin, Hist. Nat. d. Veg. Par. p. 622, Plate X, fig. 2; Montagne, Sylloge Cryptog. p. 250; Peyritsch Sitz. d. Wien. Acad. Vol. LXVIII, p. 247; Sorokin, Veg. Par. of Man and Anim. as a Cause of Contagious Diseases, Vol. II, p. 412, Plate XXXIII, fig. 781; Winter, Die Pilze Deutsch. II, p. 921; Berleso Malpighia, Vol. III, p. 54; also in Saccardo, Sylloge Fung. Vol. VIII, p. 911; Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 12. See also Rouget, Production Paras., etc. in Ann. d. l. Soc. Entomol. d. France, 1850, T. VIII, p. 21, Plate I, figs. 1–7.

"Dark yellow-brown; Paraphyses inserted on a broad base, irregularly dichotomous, about as long as the perithecium, yellow; stalk much shorter than the perithecium."

On *Brachinus crepitans* L., *B. scolopeta* F., *B. explodens* Duft., Europe.

The above description is quoted from Peyritsch (l. c.), although it is quite useless for purposes of identification. The figures given by Robin appear at first sight to be good, and to furnish a means of identifying the species; but some of them are almost certainly incorrect in their anatomical details, and it is doubtful whether any of them are to be depended upon, either as exact reproductions of the originals or as exhibiting the essential characters of the species. I have examined specimens of a Laboulbenia from *B. explodens*, taken in Germany, but in all cases they correspond to the rather well marked type which I have called *L. europæa* (Plate XVI, fig. 15), a form which is known to occur on several other hosts.

In a previous paper (l. c.) I have doubtfully referred to this species a form found growing densely crowded on the legs of *Platynus cincticollis* in this country; but a comparison of almost unlimited material of the various forms which I have placed together under *L. elongata* makes it clear that our form cannot be considered to be the species of Robin, unless, perhaps, the whole "*flagellata*" series should be united under his name. Whether *L. Rougetii*, which is unfortunately the type of the genus, is really distinct from either *L. elongata*, *L. flagellata*, *L. anceps*, or *L. europæa* must remain uncertain until sufficient material of the European forms on *Brachinus* has been examined to make clear what is really intended by Robin's name. It should be mentioned, however, that I have never seen a specimen of *L. flagellata* on any of the very numerous specimens of American Brachinus examined, even from situations where species of Platynus infested by *L. elongata* were common. The forms of *L. Brachini* (Plate XX, fig. 2), which at first sight seem identical with some of the varieties of *L. elongata*, cannot be confused, on careful comparison, either with this species or with *L. Europæa*.

A few old specimens of *L. europæa* in my possession, from European material of Brachinus, in which the appendages have been broken and have produced a few abnormal branches at the base, bear, it must be admitted, a distinct resemblance to the dark brown figure of Robin's Plate X.

LABOULBENIA EUROPÆA Thaxter. Plate XVI, figs. 15–17.

Amber-brown. Perithecium darker amber-colored, rather narrow, but sometimes inflated, its tip nearly straight, broad, black except the edges of the coarse lips, which are turned slightly outward, an olive shade extending below the blackened portion. Outer appendage hyaline, suffused below with olive-brown, deeply colored externally near the base, simple or more commonly consisting of a basal and a sub-basal cell which bears two long slender tapering branches; more rarely the basal cell bears two branches directly, the inner simple, the outer bearing two branches from its basal cell. Inner appendage consisting of a basal cell which may bear two branches directly, or more commonly is followed by a sub-basal cell bearing a long, simple, sterile branch and a shorter fertile branch, producing several antheridia and one or two sterile divisions, which sometimes become elongate. Receptacle normal, a very slight olive suffusion on the external surface of cell IV. Spores, 55–59 × 4–4.5 μ. Perithecia, 130–140 × 55 μ. Appendages (longest), 250 μ. Total length to tip of perithecium, 250–300 μ.

On *Chlænius æneocephalus* Dej., *C. chrysocephalus* Rossi, *Callistus lunatus* Fabr., *Aptinus mutilatus* Fabr., *Brachinus explodens* Duft., Europe.

This species, although occurring on such a variety of hosts, is very constant in its essential characters, and appears to be undoubtedly distinct from *L. flagellata* and its near allies. Its general color, the shape of its perithecium, the olive coloration at the base of its outer appendage, and the blackened external branch of the latter, serve to distinguish it readily. It is allied to *L. flagellata* and *L. Pterostichi*, and as already mentioned, may eventually prove to be the form intended by Robin as the type of his *L. Rougetii*, although the data available for distinguishing this species would hardly lead one to unite the two. The specimens examined are from Greece and Central Europe.

LABOULBENIA ELONGATA Thaxter. Plate I, figs. 32–39; Plate II, figs. 5, 7, 8, 13–18; Plate XVI, figs. 1–14.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 10; *L. gigantea* Istvánffi, Termész. Füset. Vol. XVIII, 1895, p. 82, Plate II.

Perithecium nearly colorless or straw yellow to almost black-brown, blackened below the apex, hyaline about the pore, more or less evenly inflated, the rather small lip-cells turned slightly outward. Appendages very variable in form, size, and color; hyaline or yellowish to deep red brown, arising from an inner and an outer basal cell; the outer bearing a single branch, rarely simple, usually once or twice branched; the inner producing two branches on either side, rarely simple, often many times successively branched forming a dense tuft; the branches rigid and distally attenuated, or flexuous, with bluntly rounded tips, slender or stout, rather closely septate. Antheridia solitary, or borne in pairs laterally or terminally, on sometimes densely crowded branchlets. Receptacle short and rather stout, or very elongate; normal in form, hyaline or distally suffused with brown. Spores, 60–100 × 5–8 μ. Perithecia, 110–240 × 35–95 μ. Longest appendages, 180–750 μ. Total length to tip of perithecium, 300–800 μ (1200 μ *sec.* Istvánffi).

On *Platynus cincticollis* Say, *P. extensicollis* Say, *P. melanarius* Dej., *P. ruficornis* Lec., *P. picticornis* Newm., *P. bicolor* Lec., *P. Pusillus* Lec., *P. dissectus* Lec., *P. brunneomarginatus* Mann., *P. floridanus* Lec., *P. ovipennis* Mann., *P. sinuatus* Dej., *Anisodactylus baltimorensis* Say, Maine to Florida and California. On *Colpodes purpuripennis* Chaud., *C. cœruleomarginatus* Chaud., *C. duplex* Bates, *C. grata* Bates, *C. petilus* But., *C. incultus* Bates, *C. sphodroides* Chaud., *C. cyanonotus* Chaud., *C. tenuicornis* Chaud., Mexico and Central America. On *Platynus* (?) sp., Japan. On *Limosthenes* (*Pristonychus*) *cavicola* Sch., *Platynus ruficornis* Goeze, Europe. On *Macrochilus biguttatus* Goeze, Liberia, Africa.

In this species I have included a large series of specimens from various parts of the world which, though varying very greatly in form and size, appear to be identical, since every imaginable gradation exists between the more extreme types. The figures of *L. flagellata*, given by Peyritsch, which it most nearly resembles, are so bad that, without a knowledge of the host, it would be impossible to determine the species with any certainty. His fig. 2, for example, if correctly drawn, would belong to a quite different type, and his fig. 6 is undoubtedly the young condition of very different and undescribed form. It may be noted further that although Bembidia occur abundantly associated with the species of Platynus, on which the present species is parasitic, I have never found a specimen on the former host. Whether it should not be united with *L. anceps* is another question which only the examination of European material can determine, as it is not clear from Peyritsch's account in what respects this species differs from *L. flagellata*. The only peculiarity of the former species appears to be that cell III is unusually elongated; yet this may have been accidental or due to careless reproduction. That the typical *elongata* occurs in Europe on Platynus (Anchomenus) as well as on *Pristonychus cavicola* is an undoubted fact, the *L. gigantea* of Istvánffi being identical with the most typical forms of *elongata*, and the material which I have seen derived from species of Platynus taken in the neighborhood of Vienna, seems also not separable from the same form. The retention of the species as distinct from *L. flagellata* and *L. anceps* is therefore provisional, and it may prove that all three are the same.

The variations of *L. elongata*, which are very numerous and are in part represented on Plate XVI, appear to be due in part to the character of the individual host attacked and partly to the position in which the plant grows; this species illustrating better than any other the variations which have been previously alluded to (p. 240) as dependent on these circumstances. In brief, the species may be very elongate (more than a millimetre in length from the foot to the apex of the perithecium) or very short (300 μ or even less) and stout; in color it may vary from pale straw color to deep brown, specimens sometimes occurring that are nearly opaque; the appendages may be short and stout or very long and slender, sometimes almost simple, in other cases very densely branched, hyaline or opaque, yet conditions showing every gradation between these extremes are so numerous as to render the separation even of varieties impossible.

One of the short stout varieties that occurs on the legs of *Platynus cincticollis* was formerly thought by me to be a form of *L. Rougetii*, but it seems certain that this variation is merely due to the position of growth, since it occurs also on the jaws of the host as well as when the parasite grows crowded at the tips of the elytra. The type-form is that which grows as a rule near the base of the legs on the inferior surface of the thorax, and is represented in fig. 4, Plate XVI. It is one of the commonest of all the species as well as the most widely distributed, and it is to be hoped that its great variability will not lead to an extended synonomy in the future.

LABOULBENIA FLAGELLATA Peyritsch.

Peyritsch Sitz. d. Wien. Acad. LXVIII, p. 247, Plate I, figs. 1–3; Sorokin Veg. Paras. Vol. II, p. 415, Plate XXXII, fig. 765; Winter's Pilze Deutsch. II, p. 921; Berlese, Malpighia, III, p. 55; also in Saccardo Sylloge Fung. Vol. VIII. p. 910.

"Light yellowish brown, only the mamilla of the perithecium blackish about its base; pseudoparaphyses few in number (4–7), about equal, simple or divided at the base, colorless, for the most part exceeding the perithecium in length."

On *Bembidium lunatum* Duft., *Anchomenus albipes* F., *A. marginatus* L.

The above description is taken from Peyritsch, but is quite inadequate as a means of determining the species; which, as has been previously mentioned, may have to be united with *L. elongata*. I have never in my own experience seen any species like it on members of the genus Bembidium.

LABOULBENIA ANCEPS Peyritsch.

Sitz. der Wien. Acad. LXVIII, p. 247, Plate I, fig. 7; Sorokin, l. c. p. 416, fig. 758; Winter, l. c. p. 922; Berlese, l. c. p. 56; Saccardo, l. c. p. 911; Thaxter, l. c. Vol. XXVIII, p. 176.

"Light yellowish brown; pseudoparaphyses in small numbers, bent, about as long as the perithecium and colorless."

On the legs of *Anchomenus viduus* Pz., vicinity of Vienna, Austria.

As in the previous instance, this species cannot be determined from published data. It seems peculiar from the elongation of cell III, but is otherwise without characters which would distinguish it. It may have to be ultimately united with one or both of the preceding species.

LABOULBENIA PAUPERCULA Thaxter. Plate XIII, figs. 24–27; Plate I, fig. 9.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 269.

Becoming more or less deeply suffused with olive brown. Perithecium often irregularly bent, its lip cells prominently distinguished, distally nearly truncate. Appendages arising side by side in a plane at right angles to the usual position, so that there appears to be but one appendage, the larger (outer) usually once branched above its sub-basal cell, the smaller (inner) consisting of a small basal cell bearing usually two short branches more commonly simple, and bearing small groups of antheridia. Receptacle rather small; hyaline, becoming more or less deeply suffused with brown, except the lower part of the rather large basal cell; cell V twisted out of its normal position and only visible on one side, as a rule. Spores, $45 \times 4.5\,\mu$. Perithecia, $100\text{–}120 \times 40\,\mu$. Appendages, longest, 250–350 μ. Total length to tip of perithecium, 160–222 μ.

On *Platynus extensicollis* Say, *P. ruficornis* Lec., *P. melanarius* Dej., and *Platynus spp. indet.*, Maine to Virginia.

This small species appears to be constant in its characters, and is at once separable by the twist which involves the basal and insertion cells of the appendages as well as cells (IV) and (V) of the receptacle, and which would lead one to suppose, at first sight, that the plant had but one appendage, as was stated in the original description. It usually occurs on the thorax of its hosts and on the adjacent bases of the elytra.

LABOULBENIA RIGIDA Thaxter. Plate XV, figs. 16–17.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 475.

More or less deeply tinged with olive brown. Perithecium becoming almost or quite opaque, somewhat inflated, a slight depression at its base above the more or less bulging terminal portion of the receptacle, its apex stout, snout-like, bent slightly inward. Appendages arising from two basal cells, the outer of which gives rise to a single simple or rarely once branched rigid branch, tapering slightly or nearly cylindrical; the inner producing two similar somewhat shorter branches almost invariably simple, and bearing near the base solitary sessile antheridia. Receptacle normal, sometimes rather elongate. Spores, 75 × 55 μ. Perithecia, 125–150 × 10 μ. Appendages (longest), 300 μ. Receptacle, 185–300 μ. Total length to tip of perithecium (largest), 300 μ.

On *Pterostichus patruelis* Dej., Maine and Massachusetts.

This species may be distinguished by its rigid habit, straight single outer appendage and the blunt, snout-like apex of its perithecium. It is one of the less well marked types of the genus, yet sufficient material from the two localities mentioned indicates that its characters are sufficiently defined to warrant its specific separation from other species of the *flagellata* type.

Laboulbenia Pterostichi Thaxter. Plate XVI, figs. 18–21.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 166.

Hyaline, becoming more or less, often deeply, suffused with olive brown. Perithecium becoming deeply suffused, the outer margin commonly straight, the apex rather coarse-lipped, the lip cells hyaline about the pore, more or less blackened below. Outer appendage consisting of a large basal cell, above which it is usually two to three times successively dichotomously branched, the ultimate branches long, straight, tinged, especially the outer ones, with reddish brown, the outmost often irregularly branched. Inner appendage consisting of a small basal cell, giving rise to from one to three short branches, bearing one to several fertile branchlets, sometimes also to one or more long sterile branches. Receptacle normal, usually elongate. Spores, 75–80 × 6.5 μ. Perithecium, 130–160 × 48–55 μ. Appendages (longest), 725 μ, average, 400–500 μ.

On *Pterostichus adoxus* Say, and *P. luctuosus* Dej., Maine; *P. mancus* Lec., and *P. relictus* Newm., Southern States. On *Anisodactylus nigerrimus* Dej., vicinity of Cambridge.

This species is very closely allied to *L. elongata* and also to *L. polyphaga*, of which it may prove to be a mere variety. In some cases, especially in the variety on Anisodactylus, which is very large (about 730 μ to the tip of its perithecium), the inner appendage may be more or less copiously branched. As a rule, however, in the typical form the inner basal cell of the appendage bears two short branches often less well developed than those shown in fig. 18, and bearing a variable number of branchlets which bear the antheridia terminally in pairs (fig. 20), the whole sometimes forming a short, dense tuft, as in *L. polyphaga*. The species usually grows densely crowded on all parts of the host, including the extremities of the legs, where they do not appear to vary greatly.

Laboulbenia polyphaga Thaxter. Plate XV, figs. 18–21.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 165.

Perithecium hyaline, becoming more or less deeply tinged with brown, rather narrow, the outer edge nearly straight, with a more or less well marked prominence below the apex; the tip prominent, rather narrow, bent outward, deep black, hyaline about the pore, with brown shades more or less well marked below the tip and about the lower half. Appendages two, the outer consisting of a large basal cell, which may be continued directly to form a long, simple, straight appendage distinctly constricted at the joints, or may be more or less copiously branched. The inner basal cell bears one or two short branches, from which arise small dense clusters of brownish antheridia, and rarely a more elongate sterile branch. Receptacle rather slender, a more or less well marked brown suffusion usually present in the distal portion; sometimes wholly suffused with brown. Spores, 45 × 4 μ. Perithecia, average, 85 × 30 μ. Appendages, longest, 300 μ. Total length to tip of perithecium, average, 200–220 μ.

On elytra of *Olisthopus parmatus* Say, *Stenolophus limbalis* Lec., *S. fuliginosus* Dej., *Badister maculatus* Lec. (Texas); *Harpalus pleuriticus* Kirby, *Bradycellus rupestris* Say, *Agonoderus pallipes* Fabr., Maine to Texas. A carabid near *Stenolophus*, Brazil, and *Amara* sp., Liberia, Africa.

This form, although presenting no striking peculiarities of structure, seems sufficiently well defined to warrant its separation as a distinct species. It is nearly allied to *L. Pterostichi*, and may prove a variety of this species. A form apparently identical with it occurs on several species of *Loxandrus* from Florida and Texas. The specimens on Badister are more or less evenly suffused with brownish yellow. It varies very greatly in the character of its outer appendage, which may be quite simple, as in fig. 18, or may often be rather copiously branched, resembling almost exactly the outer appendage of fig. 13 (*L. terminalis*); its ultimate branches, however, are never as long as in this species. Its antheridia are usually densely clustered in a tuft, the inner appendage only rarely producing elongated sterile branchlets. The perithecia are almost invariably blackened externally near the base, and usually bulge slightly at this point, as indicated in the figure which represents only the more simple type. The affected hosts are found in various situations, under stones or in rubbish, very often in rather dry situations. The determination of the specimens on Amara is not yet quite definite, since they vary slightly from the American form.

LABOULBENIA TERMINALIS Thaxter. Plate XV, figs. 13–15.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 475.

Perithecium deeply suffused with smoky brown, slightly inflated, the inner margin evenly curved outward, the outer more nearly straight, but bent abruptly outward to the large prominent apex, the lips of which are well defined and outwardly oblique. Appendages arising from two basal cells, a very large outer and a much smaller inner; the outer giving rise to two cells, each of which bears terminally from two to three long, slender, tapering, flexuous branches tinged, at least basally, with reddish brown; the inner bearing a single cell, as a rule followed by two terminal cells which give rise to groups of two or three rather slender sessile antheridia; insertion cell placed just below the middle of the perithecium. Receptacle pointed below, broad above, nearly hyaline or evenly tinged with brownish, cell VII slightly prominent below the perithecium. Spores, 55 × 5.5 μ. Perithecia, 120–150 × 45–50 μ. Receptacle, 200–220 μ. Total length to tips of perithecium, 275–340 μ.

On *Pterostichus luctuosus* Dej., Maine and Massachusetts.

This species occurs in tufts at the tips of the elytra or abdomen, apparently never elsewhere. It is allied to forms of *L. polyphaga* and *L. Pterostichi*, from which it is at once distinguished by its perithecium, the broad apex of which is peculiarly flattened and bent strongly outward. It is comparatively rare, and does not appear to vary to any extent.

LABOULBENIA CONTORTA Thaxter. Plate XV, figs. 1–5.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 42.

More or less suffused with reddish brown. Perithecium becoming suffused with blackish brown, sometimes quite opaque; outwardly inflated, its tip turned strongly outward, the lip-cells forming a very broad and characteristic hatchet-shaped apex, its edge becoming almost vertical, the whole perithecium somewhat twisted and bent toward the appendages, its axis crossing theirs in mature individuals about at right angles. Appendages arising from two basal cells, the outer large, elongate, giving rise to a single appendage once branched or simple; the inner half as large, producing usually two simple branches, each usually producing a single pair of antheridia. Receptacle rather elongate, abruptly expanded above cell II; cells I–II forming a long, nearly cylindrical, stout stalk, rather abruptly contracted at the foot; cells IV–V elongated and twisted so that the appendages and their insertion cell are often carried across at right angles to the axis of the perithecium. Spores, 75 × 5 μ. Perithecia, 150–180 × 60–75 μ. Total length to tip of perithecium, 330–400 μ; greatest width, 90–100 μ. Appendages about 300 μ.

On *Platynus extensicollis* Say, and *P. affinis* Kirby, Maine to Virginia.

This curious species is very constant in form, and is abundantly distinct from any other species of the *flagellata* type. It is at once distinguished by the hatchet-shaped apex of its perithecium and the peculiar distortion which grows more marked in older specimens. The species is a rare one, and is found almost invariably on the inferior lateral face of the prothorax of its host, usually on the right side.

LABOULBENIA GIBBEROSA Thaxter. Plate XV, figs. 6–8.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 43.

More or less faintly tinged with reddish brown. Perithecium short, stout, expanding slightly from the base to a conspicuous external hunch just below its broad, almost truncate apex. Appendages arising from a large outer and a very small inner basal cell; simple or bearing two to three branches, always above the sub-basal cell, constricted at the septa, the segments becoming slightly inflated, the tips usually curved and tapering: the disk of insertion small and thick. Receptacle elongate, strongly twisted above cell II, the twist continued by cells IV and V, which are much elongated, and carry the appendages out at right angles to the axis of the perithecium. Spores, 50 × 4.5 μ. Appendages, 180 μ. Perithecia, 125 × 50 μ. Total length to tip of perithecium, 500–550 μ.

On *Platynus extensicollis*, New England.

A number of specimens of this rare and singular species show that the twisted receptacle is a constant character, which is sometimes carried to such an extreme that the ordinary direction of the appendages is reversed; the elongation and curvature of cells IV and V bending them toward the base of the receptacle. The species is large and unusually elongate, growing on the inferior surface of its host, near the base of the middle pair of legs. Specimens from York, Maine, and the vicinity of Cambridge indicate that the species is very constant and well marked.

LABOULBENIA VULGARIS Peyritsch. Plate XIII, figs. 1–3.

Peyritsch, Sitz. der Wien. Acad. Vol. LXVIII, p. 248, Plate II, figs. 17–26; Sorokin, Veg. Paras. of Man, etc, Vol. II, p. 417, Plate XXXII, figs. 760, 764, 766–769; Winter, Die Pilze Deutsch. Band. II, p. 920, fig. 1, 922; Berlese, Malpighia, Vol. III, p. 56; Saccardo Sylloge, Vol. VIII, p. 912; Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 44.

Hyaline, becoming more or less suffused with blackish brown. Perithecium becoming blackish, usually rather narrow, its apex large and blunt, commonly bent outward. Appendages consisting of two basal cells, the outer usually much the largest; the single outer appendage usually simple, or bearing two or three usually simple branches from its second or third cell; the inner producing usually two very short branches; the insertion-cell placed opposite the middle of the perithecium. Receptacle often rather elongate, the basal and sub-basal cells forming a stalk, rather abruptly widened distally, and colorless or more or less suffused about the septum. The distal portion of the receptacle also more or less suffused. Spores, $54 \times 4\,\mu$. Perithecia, $110–150 \times 44–48\,\mu$. Appendage, longer, $185\,\mu$. Total length to tip of perithecium, $220–300\,\mu$.

On *Bembidium mexicanum* Dej., *B. lævigatum* Say, and many undetermined species; Maine to Washington and Mexico; on *Trechus chalybeus* Mann., California; on *Bembidium littorale* Pz., *B. lunatum* Duft., *B. fasciolatum* Duft., *B. punctulatum* Drap., *B. obsoletum* Dej., *B. Andreæ* Sch., *B. flammulatum* Clair., *B. decorum* Pz., *B. femoratum* Sturm, *B. bipunctatum* Duft., Europe.

The species of Laboulbenia which occur on members of the genus Bembidium are in need of further study than I have been able to give them; and since they are very apt to occur in a rather imperfect condition, it is a matter of some difficulty to classify any considerable amount of material that has been obtained from this source. From my own materials I have selected this form to represent the present species; since, although it is not at all certain that it is the only one which Peyritsch included under this name, it is certainly one of the forms that he had before him in drawing his figures. It is characterized by its stout outer appendage, which may be quite simple, or may produce a small group of short, stout branches above its third cell. The two figures represent typical specimens, the one (fig. 2) from *B. mexicanum* collected in Mexico, the other from *B. lævigatum* from Kansas. Specimens in my possession from *B. Andreæ* taken in Austria, and from an undetermined species from the Province of Quebec collected by Dr. Richards, do not differ in any respect from the form which is everywhere common on various species of this beetle. Certain forms occur, nevertheless, which seem to some extent intermediate between this species and that subsequently described as *L. pedicillata*, which may also have been seen by Peyritsch and confused by him with *L. vulgaris*. That he had no very distinct idea of the distinguishing characters of his species is indicated by his assertion that he had observed it on the staphylinid beetle *Deleaster dichrous*, which is most improbable. The two species last mentioned are readily separated by the relation in position in either case between the insertion cell and the base of the perithecium, indicated in the figures, even if other more important distinctions like the character of the appendages and the form of the perithecium were not available for this purpose. The figures given in the present instance are not very satisfactory, the form of the perithecium not being well shown.

LABOULBENIA PEDICILLATA Thaxter. Plate XIII, figs. 4–8.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 44.

Hyaline, becoming more or less deeply suffused with brown. Perithecium inwardly inflated, often with a median external prominence; distally sub-conical, the tip somewhat pointed, nearly symmetrical. Appendages somewhat exceeding the perithecium; usually curved toward it; arising from two basal cells, the outer twice as large as the inner, giving rise to a branch on its inner upper side and followed above by a roundish cell, its lower septum blackish, from which are produced often two to five branches, which may be one to three times sub-dichotomously branched; the branches curved, often slightly circinate at the apex; the inner basal cell giving rise to a variable number of short branches, curved toward the perithecium. Basal and sub-basal cells of the receptacle forming an often very elongate stalk, abruptly distinguished from the distal portion; cells IV and V nearly equal. Spores, 50 × 3.5 μ. Perithecia, 90–95 × 36–40 μ. Appendages, 90–150 μ (longer). Total length to tip of perithecium, 180–300 μ.

On various species of *Bembidium*, Maine to Virginia, Washington.

This species, although so distinct in its typical form, approaches *L. vulgaris* in some cases, from which, as above distinguished, it seems, however, quite distinct. The production of two branches from its outer basal cell, the much lower position of its insertion-cell, its pointed perithecium, as well as the character of cells IV and V, which are nearly equal and separated by an almost vertical septum, serve to define it. It may be mentioned that although some of Peyritsch's figures of *L. vulgaris* bear a certain resemblance to this species, none of them have the character just mentioned. The species varies considerably in the luxuriance of its appendages and in the length of its stalk-cell, specimens occurring at the base of the legs being commonly the largest. It is not uncommon on various Bembidia at the margins of ponds and streams.

LABOULBENIA CASNONIÆ Thaxter. Plate XIII, figs. 22–23.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 266.

Pale olivaceous, becoming olive brown. Perithecium rather small and narrow, slightly inflated, the lip-cells prominent, bent slightly outward, the pore external. Appendages hyaline, the outer especially becoming deep olive brown externally at and toward its base; arising from a larger outer and smaller inner basal cell; the outer appendage simple, tapering, rather closely septate, constricted at its lower septa, about twice as long as the perithecium; the inner basal cell gives rise to two, perhaps more, branches, short branched and bearing single antheridia laterally. Receptacle normal, cell II large, the rest small; becoming more or less suffused with brown, the distal portion coarsely, though not very distinctly, punctate in the regions most darkly colored. Spores, 35–40 × 4 μ. Perithecia, 75 × 30 μ. Appendages, outer (larger), 170 μ. Total length to tip of perithecium, 160–200 μ.

On *Casnonia pennsylvanica* Linn., Connecticut and Tennessee.

About two dozen specimens of this somewhat insignificant, though rare, species, have been examined, and seem to be quite constant in their essential characters. Its simple outer appendage seems invariable, and although it might perhaps be confused with some of the varieties of

L. polyphaga, it seems decidedly distinct from this species as well as from any of the varieties of *L. elongata*. It occurs at the apex of the elytra of its host.

LABOULBENIA NEBRIÆ Peyritsch. Plate XIII, figs. 19–21.

Peyritsch, Sitz. d. Wien. Acad. LXIV, p. 455, Plate II, figs. 4–8; l. c. LXVIII, p. 249, Plate III, fig. 29; Sorokin, Veg. Par. Vol. II, l. c. 417, Plate XXXII, fig. 772; Winter, Pilze Deutsch. p. 922; Berlese Malpighia, III, p. 57; Saccardo Sylloge, Vol. VIII, p. 912; Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 45.

Becoming suffused with blackish brown, the perithecium and distal portion of the receptacle eventually quite opaque. Perithecium short and stout; its tip bent outward, the lip-cells with hyaline margins, not very prominently distinguished; the pore external. Appendages arising from an outer and much smaller inner basal cell; the outer simple, slender, distally attenuated, rather remotely septate, somewhat rigid, becoming brown but not opaque: the inner basal cell gives rise to one or two branches, short, bearing one or two antheridia or producing one or two long sterile branches: the insertion cell above the middle of the perithecium. Receptacle normal, the basal and sub-basal cells forming a more or less, often elongate, stalk-like base, expanding rather abruptly below the terminal opaque portion of the receptacle; both becoming brownish, but not opaque, the basal cell often tapering below. Spores, 75 × 7.5 μ. Perithecia, 118–166 × 44–66 μ. Average, 55 × 150 μ. Appendages, longest, 370–550 μ. Total length to tip of perithecium, 260–555 μ. Average, 310 × 92 μ.

On *Nebria brunnea* Duft., and *N. Villæ* Dej., Europe. On *N. pallipes* Say, Nova Scotia to Virginia. On *N. Sahlbergi* Fisch, Washington, and *N. gregaria* Fisch, Aleutian islands.

This well-marked species was found in great abundance in the vicinity of New Haven, often almost completely covering the host with a thick fur. It is subject to considerable variation in size; but is otherwise quite constant in its essential characters, and is readily distinguished by the opacity of its perithecium and the broad distal portion of its receptacle, the distal cells of which become wholly indistinguishable; the high position of its insertion-cell, its single rigid outer appendage, etc. When crushed the blackened portions are seen to be very coarsely punctate. The host occurs under stones along shady brooks, and the parasite is found in the best condition in June and early September. According to Peyritsch this species was first noticed by Mayhr (1852), who considered it a pathological chitinous production.

LABOULBENIA SUBTERRANEA Thaxter. Plate XIII, figs. 9–11.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 163.

More or less suffused with brown, or with two basal cells quite hyaline. Perithecium long, slightly inflated at the base, tapering more or less evenly to the large, blunt, sub-cylindrical apex, the lips of which are turned slightly outward. Appendages arising from two basal cells, the outer very large, almost covering the very small inner one, and continued directly to form the usually very large, long, simple outer appendage, which is septate, slightly constricted at the septa with a marked general constriction usually present towards the base, accompanied by a brown suffusion involving one or more cells. The inner basal cell gives rise to a single short branch bearing one or two antheridia. The black insertion-cell eventually thrust obliquely outward by cell V free from the perithecium. Receptacle sometimes short, more often very long through the elongation of cell II, the distal portion reduced, usually blackish brown, while the two basal cells are hyaline. Perithecia, 135–160 × 50 μ. Outer appendage, longest, 1065 μ; average, 725 μ. Total length to tip of perithecium, 220–480 μ; average, 375 μ.

On *Anophthalmus Menetriesii* Motsch., in limestone caves, Kentucky; *A. pusio* Horn, West Virginia. On *A. Motschulskyi* Schm., Carniola, Austria.

A peculiar and variable species. Forms occurring on the jaws of the host (a blind cave beetle) are short and compact, while others, especially those occurring on the lower surface of the abdomen, are very elongate. The European specimens are small and rather slender, but can hardly be separated from the American material.

LABOULBENIA PERPENDICULARIS nov. sp. Plate XIII, figs. 15–18.

L. truncata pro parte: Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 45.

Hyaline, becoming more or less suffused with olive brown. Perithecium brown, slightly inflated toward the base, the distal portion often long and narrow, the tip bent inward, its apex broad and flat. Outer appendage rigid, irregular; its basal cell long, followed by two cells, the upper smaller, often inflated, usually followed by a single cell, which bears terminally two rather short branches; inner appendage consisting of a rather large basal cell, the whole inner face of which is occupied by the bases of two long branches set one above the other, projecting across and beyond the perithecium at right angles to the outer appendage; one or both once branched near their tips and bearing a single antheridium from their basal cells. Receptacle distally rather abruptly expanded in the region of cell VI, becoming brownish, the darker distal portions sometimes obscurely punctate. Spores, 65–78 × 5 μ. Perithecia, 120–150 × 45–50 μ. Appendages, outer (longest), 370–400 μ; inner, longest, 350–450. Total length to tip of perithecium, 250–330 μ.

On undetermined species of Bembidium, Connecticut, Virginia (Pergande), Washington (Miss Parker).

This species was at first considered a more fully developed type of *L. truncata*, which is undoubtedly its nearest ally. The differences indicated by the above description seem, however, sufficiently constant to separate it without difficulty, although it is barely possible that *L. truncata* may be the same species greatly modified by its position of growth. The peculiar mode of development by which its inner appendage is made to cross the perithecium at right angles is quite unique. The outer appendage is almost invariably broken off above its third cell, as shown in fig. 15; and the branches of the inner appendage are rarely perfect. But one of these branches (the upper) usually produces its single antheridium, the second, as well as all the portion of the first above the antheridium, being developed after fertilization. Fig. 16 represents the single inner appendage shortly before fertilization has been effected, the short terminal unicellular branch at the right subsequently growing into the elongate appendage shown in fig. 15. There is some variation in the form of the perithecium, which may be more distinctly narrow toward its extremity, and the latter may be more strongly bent inward than is shown by the specimen figured (fig. 15). The species has been observed only on or at the base of the anterior pair of legs.

LABOULBENIA TRUNCATA Thaxter. Plate XIII, figs. 12–14.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 267.

Dark olive brown, sometimes nearly opaque. Peritheeium large, the middle third expanded slightly just above the insertion of the appendages, otherwise sub-cylindrical; the dark truncate apex slightly oblique inwardly, usually as broad as the base, with large, nearly hyaline lips about the pore. Appendages two: the outer straight, stout, dark brown at the base, unbranched, tapering to a slender, hyaline apex: the inner short, slender, simple, hyaline, its base occupying less than a third of the horizontal black disk of insertion, which is situated about opposite the middle of the perithecium. Receptacle short, wedge-shaped: cell I small, triangular, its lower half nearly hyaline, contrasting, its upper as dark as the basal portion of the outer appendage; the darker portions coarsely punctate. Spores, 55–60 × 4.5 μ. Perithecia, 90–100 × 35–40 μ. Appendages, outer, 150 μ. Total length to tip of perithecium, 175–180 μ. Greatest width, 66 μ.

On *Bembidium* sp., New Hartford, Connecticut.

A very small and singular species, distinguished from all others by its perithecium, which is nearly as broad at its hatchet-shaped tip as at its base. It is closely allied to the preceding species, but, as above stated, seems undoubtedly distinct. It has been found but once on an undetermined species of *Bembidium* captured at the margin of a brook in shady woods. It grew crowded on one of the anterior legs of its host.

LABOULBENIA CATOSCOPI Thaxter. Plate XVII, figs. 11–13.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 164.

Pale amber brown, becoming suffused with olive brown at the base of the perithecium and in the region of cell III. Perithecium moderate, the apex rather prominent, blackened except about the pore, the blackening continued downward externally to the body of the perithecium. Outer appendage single, simple, nearly straight, exceeding the perithecium; its basal cell very large, outwardly strongly inflated and blackened. Inner appendage consisting of a much smaller basal cell, from which arise directly two branches, the latter two to three times successively branched with small basal cells and bearing a few solitary antheridia near the base. Receptacle rather elongate, normal, cell IV projecting outward beyond the rather thick black insertion cell, which is situated between the two lower thirds of the perithecium. Spores, 65 × 5 μ. Perithecia, 100–130 × 37 μ. Appendages (longest observed), 110–130 μ. Total length to tip of perithecia, 250–320 μ.

On *Catoscopus guatemalensis* Bates, Mexico. On *Catoscopus spp.*, Liberia, Africa.

Closely resembling *L. elongata* in general form, from which it is at once distinguished by the inflated basal cell of the simple outer appendage. More abundant material may show that the measurements of the appendages given are too small. The fourteen types were obtained from the abdomen of specimens in the collection of the Museum at Cambridge. Further material derived from two species of Catoscopus collected by Professor Cook in Liberia is identical with the Mexican form, although the basal cell of the outer appendage is not so prominently inflated.

LABOULBENIA UMBONATA Thaxter. Plate XV, figs. 9–12.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 163.

Perithecium becoming faintly, sometimes deeply, suffused with brown, projecting free from the receptacle at an angle of about 60°, the outer margin curved inward strongly to the blackish tip, the prominent ear-like lips of which are strongly incurved; a clearly defined rounded prominence on the inner side below the apex. Outer appendage hyaline, or with brown shades, consisting of a large, stout, cylindrical basal portion nearly equalling the receptacle in diameter and length, made up of a basal and somewhat shorter sub-basal cell, from the distal end of which arise two (rarely three) straight, very long and slender, tapering branches. Inner appendage arising from a very small triangular basal cell, its external wall directly continued by that of the outer appendage by which its upper surface is covered, its lower half cutting off obliquely a small portion of the large black insertion cell; its upper half producing sub-laterally a single short appendage, consisting of a single cell, bearing at its apex two rather long antheridia. Receptacle characterized by a stalk-like, slightly inflated base, made up of cells I and II, which are very large, the cells of the distal portion, except cells IV and V, very greatly reduced, so that the perithecium appears to rise almost directly from cell II. Cells IV and V elongated, carrying the broad constricted insertion cell upward, free from the perithecium; the axis of the receptacle coincident with that of the outer appendage. Spores, $60 \times 5\,\mu$. Perithecia, $110 \times 59\,\mu$ (including the hump which projects about $7\,\mu$). Appendages (longest), $925\,\mu$. Receptacle, $155–185 \times 18–33\,\mu$.

On *Stenolophus ochropezus* Say, Kittery Point, Maine, and Cambridge, Mass.

This remarkable form is one of the most clearly distinguished members of the genus, and cannot possibly be confused with any other known species. In old specimens the perithecium, especially its hump-like projection, may become almost black, but the fruiting plant is at first nearly hyaline. The lip-cells of the perithecium are not symmetrical on either side, the inner cell on the right side terminating in a rounded, ear-like tip, that on the left side being longer and narrower. The trichogyne is simple or sparingly branched, slender, and in one specimen spirally coiled toward its tip. The species has been found only on the inferior lateral face of the prothorax of its host on the right side. The beetle is common under stones about ponds, but the fungus seems decidedly rare.

LABOULBENIA LEPIDA nov. sp. Plate XIV, figs. 7–10.

Perithecium projecting at an angle to the axis of the receptacle and appendages, hyaline, becoming more or less deeply tinged with smoky brown; the apex blackened, the suffusion extending lower externally; rather evenly inflated, the tip bent strongly outward, the lip-cells prominent, hyaline-tipped, compressed around the pore. Outer appendage consisting of a large basal cell bearing two branches, their basal cells about equal, symmetrically placed and producing each two branchlets, symmetrically divergent, long, slender, somewhat flexuous, hardly tapering and simple. The inner appendage consists of a very small basal cell, from which arise one, usually two, branches, slender, short, once or twice branched, bearing a small number of antheridia terminally or laterally. Receptacle long and slender, but slightly expanded distally, the large basal and sub-basal cells forming a sub-cylindrical stalk. Spores, 46 × 7 μ. Perithecia, 110–125 × 50 μ. Appendages (longest), 425 μ. Total length to tip of perithecium, 300–330 μ.

On *Anisodactylus nigerrimus* Dej., Cambridge, Mass.

This graceful species was at first taken for a variety of *L. elegans;* yet it seems so constant in its differences that I have concluded to distinguish it as a separate species, the structure of the tips of its perithecium (fig. 8) being its most essential character. Its slender, flexuous appendages, from their form as well as from their mode of branching, also serve as a means of distinguishing it, and seem to vary but slightly from the type represented in the figure. Its position on the host is, singularly enough, exactly the same as that occupied by its near ally, *L. elegans.* It has been found in a single locality only, near the margin of Fresh Pond, where a dozen or more infested hosts have been from time to time obtained.

LABOULBENIA ELEGANS Thaxter. Plate XIV, figs. 3–6.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 13.

Hyaline, becoming finally more or less tinged with yellowish brown. Perithecium more or less inflated, abruptly constricted below the deep black apex, the lip-cells very prominent, bent strongly outward from a rounded inner jet-black prominence to the hyaline tips, mouth-like about the pore. Outer appendage arising from a rather large basal cell, above which it produces two branches, the outer simple, rigid, divergent, tapering, the inner producing from its basal cell two branches symmetrically divergent, long, rigid, simple, and tapering: the inner appendage arising from a small basal cell, which produces usually a single branch on either side which may be several times irregularly branched, the branchlets fertile, bearing a few antheridia, singly or in pairs or sterile, often falcate, peculiarly inflated toward the middle and constricted at the septa. Receptacle but slightly expanded distally, the sub-basal cell stouter than the basal, the two usually somewhat inflated and suffused in the region of their common septum. Spores, 40–50 × 4–5 μ. Perithecia, 110–150 × 50–65 μ. Appendages, longer, 250–400 μ; inner, 50–75 μ. Total length to tip of perithecium, 290 μ (larger, 335 μ).

On *Harpalus pennsylvanicus* DeG., New England.

A common and very pretty species, though more stiff and less graceful in its habit than the preceding. It is one of the few forms in which the branching of the outer appendage is almost, though not absolutely, invariable. It is at first perfectly colorless, becoming brownish only in very old individuals, and is very constant in form. It is confined to the lateral face of the prothorax of its host on the right side, where it forms a rather compact tuft just below the projecting margin; but very rarely it occurs, sometimes in company with *L. conferta*, on the corresponding left side, and has been once noticed on the anterior legs. The host is very common, and may be found in late August and early September, devouring the pollen of the common rag weed (*Ambrosia artemisiæfolia*) in open fields.

LABOULBENIA CONFERTA Thaxter. Plate XIV, figs. 12–14.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 268.

Hyaline or tinged with smoky brown, the base of the perithecium and the adjacent cells often dark brown. Perithecium straight, short and broad; tapering rather suddenly towards the apex, which is black except about the hyaline pore, the lip-cells coarse, blunt, turned very slightly outward. Appendages hyaline or brownish; the outer much the largest, its basal cell twice as large as that of the inner, and giving rise typically to three branches, themselves once or twice two- to three-branched above their basal cells; the inner similar but smaller; both the outer and inner varying to more simple forms; insertion cell small, very slightly oblique, placed slightly above the base of the perithecium. Receptacle normal. Spores of usual type, 50 × 16 μ. Perithecium, 130 × 60 μ. Appendages, maximum, 300 μ. Total length to tip of perithecium, 300 μ; greatest breadth, 70 μ.

On *Harpalus pennsylvanicus* DeG., New England.

Except for its color and the branching of its outer appendage this form might readily be taken for one of the varieties of *L. elongata.* It seems certainly distinct from this species, however, as well as from the larger *L. elegans*, with which it is rarely associated, and which it resembles in its general coloration. It usually occurs in a dense tuft on the anterior legs of its host, very rarely also on the left side of the inferior lateral face of the prothorax. Though abundant material has been examined, the species seems comparatively rare.

LABOULBENIA MACROTHECA Thaxter. Plate XVIII, figs. 5–8.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 474.

Clear amber-yellow. Perithecium large, evenly inflated, the curvature, from base to apex nearly symmetrical on either side, the apex rather large, outwardly oblique, with a blackish basal shade; the remainder of the perithecium translucent, amber-colored, the walls thick, the spore mass large. Appendages flexuous, thick, pale amber-colored or tinged with purplish, arising from two cells, the inner small and roundish, the outer much larger, two or three times as long, usually bearing a single cell with two terminal, more commonly simple, branches; the inner producing two branches, each several times branched: the outer appendages especially more or less constricted at the septa. Receptacle small, usually short and slender, the basal cell long, narrowed towards its base, the sub-basal cell short, the remaining cells relatively small. Perithecium, 130–150 × 45–55 μ. Spores, 60 × 5.5 μ. Appendages (longer), 185 μ. Receptacle, 150–165 × 35–40 μ. Total length to tip of perithecium, 240 μ (longest, 270 μ), greatest width, 55–60 μ.

On *Anisodactylus baltimorensis* Say, Maine. On *Anisodactylus sp.* (?) Bathurst, N. B. (H. M. Richards).

This species occurs not rarely on the anterior legs of its host, less frequently on the borders of the elytra. It may be distinguished by its pale amber color, large, evenly inflated perithecium, and slender receptacle, the distal portion of which is relatively unusually reduced. Fig. 6 represents the more typical habit, the basal and sub-basal cell forming a straight, rigid stalk, gradually expanding upward and characteristically constricted at the common septum. The species is most closely allied to *L. elongata*, but is always readily separable from this species by the characters just mentioned. Although growing exposed to unfavorable conditions near the tips of the anterior legs, it does not assume the short, compact form usually characteristic of species developed in this position.

LABOULBENIA ARCUATA Thaxter. Plate XVIII, figs. 1–4.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 268.

Perithecium smoky-black, becoming uniformly almost opaque; large, narrowed somewhat towards the broad, bluntly rounded, less deeply colored tip, which is nearly symmetrical or bent slightly inward. Outer appendage consisting of a rather large basal cell, from which arise one, often two, branches, which may be simple or once or twice branched; inner appendage arising from a much smaller basal cell, which produces two branches, simple or sparingly branched, bearing usually solitary antheridia laterally. Receptacle at first colorless, contrasting with the dark perithecium; but becoming slightly suffused with brown, the basal cell usually larger than the sub-basal, and strongly curved. Spores, 65 × 5 μ. Perithecia, 160–185 × 50–55 μ. Appendages longer, 240 μ. Total length to tip of perithecium, 300–350 μ; average, 320 μ.

On *Harpalus pennsylvanicus* DeG., New England.

This well marked and rather rare species is readily distinguished by its peculiar perithecium. It occurs, so far as I have observed, only on the broad tips of the anterior pair of legs (usually the left) of male individuals, where it is sufficiently conspicuous from its contrasting colors. Though the abundant material obtained is all from New England, the species, together with the remaining forms which inhabit the same host, are all doubtless widely distributed in the United States.

LABOULBENIA HARPALI Thaxter. Plate XIV, figs. 15–18.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 13.

Hyaline, becoming tinged with brown. Perithecium small, inflated below, tapering to the clearly distinguished, deep blackish-brown tip; bent sidewise from the receptacle, the lip-cells turned outward from the evenly rounded, knob-like extremity to their hyaline tips, which form a slight, pointed projection around the lateral external pore. Outer appendage consisting of a usually somewhat rounded basal cell, from which arise two branches, simple or once to twice branched, their branches rather rigid, tapering, all the cells rather short, inflated and constricted at the septa: inner appendage consisting of a small round cell producing two branches, simple or once branched below, and bearing, usually solitary, lateral antheridia. Basal cell of the receptacle sub-cylindrical, commonly longer than the sub-basal, tapering but slightly to the blunt base; the septum between the two more or less oblique. Spores, 60–68 × 5–5.5 μ. Perithecia, 90 × 40 μ. Appendages longer, 200–300 μ. Total length to tip of perithecium, 290 μ (215–300 μ).

On *Harpalus pennsylvanicus* DeG., New England.

This very common species is distinguished from all others by the peculiarly modified tip of its small perithecium. It grows, appressed and densely crowded, invariably on the anterior inferior margin of the thorax and the adjacent posterior margin of the prothorax. It is subject to but slight variation, and is doubtless widely distributed.

Laboulbenia inflata Thaxter. Plate XVII, figs. 4–6; Plate III, fig. 5.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 41.

Hyaline, becoming tinged with brown. Perithecium more or less inflated, narrowed towards the broad, blunt, often symmetrically rounded apex, becoming more or less suffused with brown, projecting outward from the receptacle. Outer appendage simple, tapering, its base made up of three short, superposed, conspicuously inflated cells constricted at the blackened septa, the distal portion more remotely septate, not inflated or constricted; the inner appendage rises from a basal cell, nearly as large as that of the outer, which gives rise to two simple, hardly divergent branches, one to three of the basal cells of which are inflated as in the outer appendages. Receptacle normal. Spores, 50 × 4.5 μ. Perithecia, average, 90 × 37 μ (largest, 110 × 50 μ). Appendages, longest, 185 μ. Total length to tip of perithecium, 150–200 μ.

On *Bradycellus rupestris* Say, South Dakota (Aldrich), Kittery Point, Maine, and Waverly, Mass.; Newport, R. I. (Richards).

This very pretty and well marked species appears to be not uncommon on the above mentioned host, which is probably identical with the beetle on which the original types were found; although this was, by an oversight, stated to be a species of Bembidium. It is distinct from all other species in the character of its appendages, and could not be mistaken for any described form unless, perhaps, *L. Philonthi*, to which it bears a slight superficial resemblance.

Laboulbenia compressa Thaxter. Plate XIV, figs. 1–2, 11.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 165.

Pale yellowish. Perithecium becoming tinged with olive-brown, inflated, the lip cells compressed to form an evenly rounded, narrow, prominent apex, which is commonly bent slightly outward, and blackish brown except about the pore, which is external and lateral. Outer appendages simple or once branched above its sub-basal cell, the lower cells slightly inflated, the branches straight and tapering. From the inner basal cell arise two branches, which may be simple or once branched, the sterile branches like the outer appendage. Receptacle normal, the basal cell usually curved. Spores, 50 × 3.7–4 μ. Perithecia, 85–100 × 30 μ. Appendages, longest, 150–200 μ. Total length to tip of perithecium, 175–260 μ, average, 210 μ.

On *Anisodactylus baltimorensis* Say, Kittery Point, Maine.

This small species in its typical form is hardly to be confused with any other by reason of its narrowly pointed perithecium; but specimens are sometimes found which indicate that it is very closely related to *L. filifera*, of which it may possibly prove to be a variety. It is almost invariably found at the base of the middle pair of legs of its host, usually at the right, rarely on the elytra, and is not very common. The spores are remarkably long and slender in proportion to the size of the perithecium. The hosts affected were found under stones about muddy ponds.

Laboulbenia filifera Thaxter. Plate XIV, figs. 19–22.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 165.

Perithecium tinged with olive-brown, the apex deeply blackened, broad, more or less evenly rounded, or nearly truncate, often symmetrical. Appendages consisting of two basal cells, the inner minute, the outer large, usually followed by a sub-basal cell, from which arise two very elongate, simple, erect, rather closely septate branches, at first dark brown above their nearly hyaline basal cells. The inner appendage consists of two short, hyaline, fertile branches, one of which may produce a long and sterile branch. Receptacle short, about equalling the perithecium in length, the anterior margin rather abruptly diverging above cell II. Spores, about 50 × 4 μ. Perithecia, average, 25 × 90 μ. Appendages, longest, 550 μ. Total length to tip of perithecium, 150–190 μ.

On *Anisodactylus Harrisii* Lec., *A. nigerrimus* Dej., *A. interpunctatus* Kirby, *Harpalus pleuriticus* Kirby, and *H. erythropus* Dej., Maine, Massachusetts, Pennsylvania.

A common species found usually densely crowded along the outer margin of the elytra towards their base, less frequently elsewhere. The very long outer appendage is usually broken off in part. The two specimens figured are type forms, but the tip of the perithecium is not in all cases so abruptly truncate, and the lip-cells are sometimes distinctly turned outward with a sub-hyaline area about the lateral pore. The hosts are common everywhere about ponds and in fields.

Laboulbenia Hageni Thaxter. Plate XVII, figs. 20–22; Plate III, fig. 4.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 470.

More or less deeply tinged with brown. Perithecium slightly inflated, tapering to the blunt outwardly oblique apex, which is blackened below the hyaline lips. Appendages arising from an outer and an inner basal cell, the outer of which is followed by a squarish cell of about the same size, from the end of which project four rather short, rigid, slightly divergent hyaline branches, which taper to blunt tips, and, as a rule, hardly exceed the tip of the perithecium: the inner
[illegible]al cell gives rise to two squarish cells, one on either side, each of which bears usually a pair
clearly d[illegible]ches similar to those just described. Receptacle short and stout, normal in form, the
turned outw[illegible]on of the basal cell hyaline. Perithecia, 55 × 18 μ. Appendages (longest), 65 μ.
slight, pointed[illegible] tip of perithecium, 100 μ.
usually somewh[illegible]*llicosus* var. *mozambica* Hagen, Africa.
branched, their bra[illegible]f a most typical and decidedly insignificant looking species of this genus on
at the septa: inner app[illegible]of a species of white ant is certainly quite unexpected in view of the
or once branched below, an[illegible]sts between this neuropterous host and the usual insects infested
tacle sub-cylindrical, common[illegible]four stiff branches arising from the sub-basal cell of the outer
the septum between the two m[illegible]oots of a molar tooth, it would be difficult to specify its dis-
40 μ. Appendages longer, 200–3[illegible] the fact that it is the smallest species of the genus. The
On *Harpalus pennsylvanicus* De[illegible]f the late Professor Hagen, by whom it was observed many
This very common species is dist[illegible]amined by the writer, collected by Dr. Peters in Africa,
its small perithecium. It grows, app[illegible]dant material was obtained.

LABOULBENIA PARVULA Thaxter. Plate XIV, figs. 22–24; Plate II, fig. 10.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 41.

Tinged with olive, becoming deep olive brown, sometimes nearly opaque. Perithecium straight, inflated below the broad, squarish apex. Outer appendage almost opaque externally at its base, consisting of a large basal cell producing distally two branches, one terminal, the other lateral or sub-lateral, both once or twice branched above their basal cells; inner appendage consisting of a smaller basal cell which gives rise to typically two branches, each once or twice branched, the ultimate branches in both appendages rigid, sub-cylindrical, erect or but slightly divergent, slender. Receptacle stout, sub-triangular; the basal cell small, hyaline or translucent, the rest eventually nearly opaque, obscurely punctate. Spores, 40 × 4 μ. Perithecia, 90–110 × 30–40 μ. Appendages, longest, 110–200 μ. Total length to tip of perithecium, average, 180–190 μ.

On *Platynus extensicollis* Say, *P. æruginosus* Dej., *P. striatopunctatus* Dej., Maine to South Carolina. On *Bembidium bimaculatum* Kirby, Washington (Miss Parker).

This small and well defined species occurs often in great numbers on the legs (usually the posterior) of its host, and not elsewhere. It was first sent me on *P. extensicollis* by Mr. Pergande, and has since been found in various localities. The appendages are, as a rule, more or less broken, and perfect specimens such as those represented in the figures are not frequently met with. When uninjured, the slender, terminal portion of the appendages is quite characteristic, but when the latter have been broken, as from the position of growth upon the host they are very likely to have been, the new branches which grow out to replace the primary ones are apt to be shorter, stouter, and without the characteristic form just mentioned. A curious development of filaments from the basal cells of a perithecium which had been partly broken off in an individual of this species, is represented in Plate II, fig. 10, and several similar instances have been observed.

LABOULBENIA SCELOPHILA Thaxter. Plate XIV, figs. 23–26.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 269.

Becoming more or less suffused with olive-brown except the nearly hyaline basal cell. Perithecium rather evenly inflated, the apex rather broad. the inner lip-cells prominent, bent slightly outward. Outer appendage consisting of a sub-cylindrical basal cell, producing distally a terminal and on its inner side a sub-terminal branch, the outer usually simple, the inner once branched above its basal cell: inner appendage consisting of a somewhat smaller but similar basal cell which produces two branches simple or once branched, bearing laterally several long, slender, curved antheridia; both appendages with their branches hardly divergent, sub-parallel and curved strongly towards and past the tip of the perithecium. Receptacle sub-triangular, short and rather stout, the partition between cells II and VI very oblique, the basal cell small, sub-triangular, hyaline. Spores, 50 × 5 μ. Perithecia, 100–120 × 40–50 μ. Appendages, longest, 180 μ. Total length to tip of perithecium, 200–220 μ.

On *Platynus extensicollis* Say, New England.

This small species is allied to *L. parvula* in general form, but is at once separable by its stouter curved appendages. It occurs only on the legs of the host mentioned, usually in small numbers, and is very constant in its characters.

LABOULBENIA RECTA Thaxter. Plate XIV, figs. 27–28.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 42.

Olivaceous. Perithecium straight, rather small, symmetrically inflated, the short, almost truncate, black apex abruptly distinguished; the wall-cells distinctly spiral. Outer appendage consisting of a basal cell bearing distally a terminal and on the inner side a sub-terminal branch; each usually once branched above its basal cell: the inner appendage consisting of a much smaller basal cell, producing two branches, each of which may be once branched, the ultimate branchlets of both appendages stiff, erect or diverging slightly towards the perithecium, tapering slightly, rather closely septate and about equal. Receptacle long, straight and rather slender. Spores, 75–80 × 6–7 μ. Appendages, longest, 200–250 μ. Perithecia, 150–180 × 50–75 μ. Total length to tip of perithecium, 350–430 μ.

On *Platynus extensicollis* Say, Maine and Connecticut.

This rare species was found in several localities about New Haven and at York, Maine, attached to the anterior legs of its host in company with *L. scelophila*, which is, perhaps, its nearest ally; although readily distinguished by its smaller size, different shape and curved appendages. It is one of the few species in which the longitudinal series of wall-cells of the perithecium have a spiral twist.

LABOULBENIA CRISTATA Thaxter. Plate II, figs. 2–3; Plate XVII, figs. 24–29.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 174.

More or less suffused with brown. Perithecium curved outward, evenly, often deeply, suffused with brown, tapering to the neck-like apex, its prominent lips turned outward, the base of the inner lip more deeply suffused. Appendages two, the outer consisting of a large, squarish cell surmounted by a sub-basal cell which bears on its upper flattened surface a series of from three to six large, straight, simple, septate dark red-brown branches set side by side antero-posteriorly in a single row, the inner very long, the outermost basally deeply blackened and contracted, curved strongly outward, its hyaline sub-erect distal portion commonly broken off. The inner basal cell very small, producing usually two short branches bearing groups of large, long-necked antheridia. Trichogyne large, branched and septate, the ultimate branches straight and tapering. Receptacle short, stout, hyaline, becoming tinged with yellowish brown. Cell I small, cell II very large, all very thick-walled. Spores, 50–55 × 4–4.5 μ. Perithecia, 110–130 × 37–45 μ. Appendages (outer, not including two basal cells), 90–480 μ, basal cells, 35 μ. Total length to tip of perithecium, 250–280 μ.

On *Pæderus littorarius* Grav., and *P. obliteratus* Lec., Maine; *Pæderus* sp.? Mexico and Nicaragua; *Pæderus ruficollis* Fabr., Austria.

A very well marked and in the case of well developed specimens one of the most striking species of the genus, easily recognized by the crest-like series of branches from the outer appendage, which, however, varies very considerably. The specimens from Mexico and Europe illustrate the extremes of development as far as the appendages are concerned, fig. 29 representing a specimen from the first mentioned locality. The species is rather common in dry or moist situations, the hosts being abundant in rubbish in cultivated land. It is doubtless this form which is mentioned by Rouget as occurring on *Pæderus* in France and confused by him with *L. Rougetii*. It is a distinctly isolated form, and cannot be said to be definitely related to any of the known species of the genus except the following, although an undescribed form occurs on Bledius, which approaches it in some respects.

LABOULBENIA DIOPSIS nov. sp. Plate III, fig. 6.

Perithecium dull amber brown, a blackish patch below the hyaline lip margins on the inner side, the inner edge rather straight, the apex large, prominent and somewhat abruptly distinguished, the insertion of the trichogyne usually conspicuous. Receptacle often very long-stalked through the great elongation of cell II; the distal portion small, compact, rather abruptly distinguished from cell II, its cells more or less uniform in size; the whole tinged with brown, the distal part more deeply. Appendages arising from an inner and an outer cell, the inner usually producing two short two- to three-celled branches bearing the long, slender antheridia; the outer followed by three cells: the lower producing from their inner side one, rarely two, superposed branches, the upper a crest-like series of branches arranged antero-posteriorly in a single row. All the branches more or less deeply tinged with brown, somewhat constricted at the septa, rarely furcate above the basal cell, often tending to grow stouter distally, the terminal cell of each bluntly rounded or tapering but slightly. Spores, about 7 × 55 μ. Perithecia, 110–140 × 30–38 μ. Receptacle: distal portion about 35 × 50 μ. Cell II, 200–500 × 25 μ. Total length to tip of perithecium, 300–800 μ.

On *Diopsis thoracica* Westw., Coffee Hill, Liberia, Africa (O. F. Cook).

This curious form, which was first observed on its singular host by Professor Cook, is the first species of the genus which has been found on a dipterous insect, in the present instance a fly with stalked eyes, and, according to Professor Cook, with riparian habits. It seems in general to be subject to little variation except in the length of cell II, which may be greatly elongated. In the general form of its perithecium and receptacle it recalls to some extent *L. subterranea;* but it is undoubtedly more closely related to *L. cristata* than to any other species, as is indicated by the form of its appendages and antheridia, as well as by the outline of its perithecium. The types were found on the legs and abdomen as well as on the eye stalks of the host on which, from their length and dark color, they are quite conspicuous.

LABOULBENIA BRACHINI Thaxter. Plate XX, figs. 1–8.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 40.

Amber yellow, becoming more or less suffused with amber brown. Perithecium rather small and stout, somewhat inflated, the apex deep black, large, bluntly rounded. Appendages consisting of two basal cells, the outer becoming blackened, bearing terminally a variable number of branches arranged in a single antero-posterior fan-like series; the branches mostly furcate near the base, the inner producing short, somewhat specialized antheridial branchlets, bearing terminally two to five antheridia. Receptacle variable, often short and stout, sometimes elongate, normal in form. Spores, 75–85 × 8 μ. Perithecia (average), 165 × 75 μ. Appendages, longest, about 375 μ. Total length to tip of perithecium, 150–650 μ. Average, 525 μ.

On *Brachinus*, several species, Maine to Texas. On *B. mexicanus* Dej., Oaxaca, Mexico.

This well marked form, although subject to very considerable variations in size, shape and in the character of its appendages, can hardly be confused with any other species. In exceptional cases the appendages are comparatively simple, as in fig. 2, in which the inner basal cell bears two ordinary branches in the usual way, but in the great majority of cases this cell becomes proliferous from its inner upper angle, each successive proliferation resulting in a branch, the resultant groups of branches forming, with the outer appendage, a crest-like series (figs. 1 and 3) of very characteristic appearance. The appendages are very apt to be broken, especially the outmost branches, which are often deeply blackened (fig. 3). When growing on the legs and jaws the specimens are usually very small and stout (fig. 1); but on other portions of the host very elongate forms often occur. The species is by no means uncommon, and has been found in numerous localities about Cambridge and Kittery (Maine). In two specimens from the last locality, fine trichogynes were obtained which are copiously branched, many of the terminal branchlets having a spiral habit and ending in a distinct knob-like enlargement. The antheridial branchlets, although not as highly developed, recall those of *L. variabilis* which, however, does not seem otherwise nearly related. The hosts are more often found under stones about ponds and streams, and are recognized by their habit of discharging a cloud of pungent vapor when disturbed.

LABOULBENIA ZANZIBARINA Thaxter. Plate XVII, figs. 1–3.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 175.

Olive brown, the basal cell nearly hyaline. Perithecium rather large, more deeply colored below the somewhat suffused tips of the lip-cells, the latter not prominently distinguished, forming a slightly enlarged, broad, somewhat flat-tipped, almost straight apex. Appendages consisting of two basal cells, the outer producing externally a single obliquely vertical series of branches, their basal cells inwardly concave and bearing externally a secondary series of branchlets arising like the primary ones and producing branchlets of the third order: the inner basal cell producing similar shorter series of branches on either side; the branches, like those of the outer appendage, some of them producing antheridial branchlets bearing a terminal row of antheridia; all the ultimate sterile branchlets of both appendages similar, cylindrical, bent slightly towards the perithecium. Receptacle becoming nearly opaque, its dark portions distinctly punctate, cell I hyaline, cell VI continued downward. Spores about 50 μ long. Perithecia, 100–110 × 3.7 μ. Appendages (longest), 200 μ. Total length to tip of perithecium, 185–200 μ.

On *Crepidogaster bimaculata* Boh, Zanzibar, Africa.

The appendages of this curious species distinguish it from all others, and in their successive one-sided branching recall those of the genus Teratomyces, this one-sided habit being even characteristic of the antheridial branchlets (fig. 3). It is scarcely possible to determine in the material available whether the inner basal cell produces a series of branches on either side or only one series. Assuming that the last is true, the fundamental habit of branching is not unlike that of *L. Brachini,* although the insertion of the primary series in the latter is more nearly horizontal. The types were taken from a specimen of the host in the Museum of Comparative Zoology, growing at the tips of the elytra and on the adjacent portions of the abdomen.

LABOULBENIA GALERITÆ Thaxter. Plate XIX, figs. 9–12.

Proc. Am. Acad. Arts and Sci., Vol. XXVII, p. 39.

Perithecium becoming almost opaque, transversely punctate, elongate, sub-cylindrical, tapering rather abruptly to the blunt apex; the lip-cells turned slightly outward; the basal wall-cells forming an abruptly differentiated, clearly defined hyaline neck-like base. Appendages consisting of two basal cells, hyaline above, black below, above which rise three connected series of superposed cells; one outer and two inner, each producing from three to six single simple branches, and forming a sub-conical body: the branches, one from each cell, tapering slightly, their distal portions straight, slightly divergent, hyaline, remotely septate; the basal portion more or less suffused with blackish brown, more closely septate, the segments inflated and constricted at the blackened septa. One or two of the lower branches from the two inner series are fertile, consisting of a single cell bearing terminally a group of from two to five long-necked, slightly curved, brownish antheridia. Insertion cell broad, free from the base of the perithecium. Receptacle variable, often elongate, cells III and IV externally or almost wholly blackened and opaque, the remaining cells hyaline or with brown suffusions. Spores, 50 × 5.5 μ. Perithecia 155 × 37 μ. Appendages (longer branches), 350 μ. Total length to tip of perithecium, 375 μ. Maximum, 600 μ.

On *Galerita janus* Fabr., District of Columbia (Pergande) to Alabama (Henderson); *G. atripes* Lec., Kansas; *Galerita* sp., Iowa; *G. mexicana* Dej., Mexico.

This common and well marked species is apparently widely distributed, and can hardly be confused with any other form unless it be the succeeding species; which is, however, immediately separable by the position of cell III, although in both the same more or less conical or pyramidal base gives rise to the three vertical series of branches, two inner and lateral and one outer, which are so characteristic in their appearance. In some cases the tips of these branches have a spiral twist, which is probably accidental, but otherwise the species is a very constant one. I know of no other form in which the perithecium is so conspicuously punctate, the spots being arranged more frequently in rather definite transverse lines and themselves often elongated transversely. The species occurs scattered indefinitely over the surface of its host, more often on the elytra.

LABOULBENIA DECIPIENS Thaxter. Plate XX, figs. 19–21.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 473.

Perithecium nearly opaque, not punctate, large, slightly and evenly inflated, tapering rather abruptly to the nearly symmetrical apex; the basal wall-cells forming a short, stout, clearly-defined, hyaline neck; the septa separating the upper wall-cells, deeper blackish and spirally twisted. Appendages consisting, as in *L. Galeritæ,* of a conical cellular base consisting of one outer and two inner rows of superposed cells, each of which bears a single simple, straight, septate branch, its lower segments slightly inflated, hardly exceeding the tip of the perithecium. Antheridia blackish, with a very long curved neck, borne singly or two together from the sub-basal cell of the inner series of superposed cells. Receptacle as in *L. Galeritæ,* except that cell III extends upward nearly to the black insertion cell of the appendages, cells IV and V being wholly included by it. Color sub-hyaline, with brownish suffusions especially in the region of cells IV and V. Perithecium, 175–278 × 55 μ (smallest, 130 × 37 μ), its stalk-like base, 40–55 × 30 μ. Receptacle (larger), 300 × 75 μ.

On *Galerita æquinoctialis* Chaud., Guatemala, and *G. nigra*, Chev., Mexico.

This species is remarkable for its close resemblance to *L. Galeritæ.* It is at once distinguished by the position of cell III and by the peculiar twist of its perithecial wall-cells, which are not punctate, as in the latter species, and differs further in the form and size of its antheridia as well as in the branches of its appendages, which are more numerous as a rule and, as far as can be determined, from the rather poor material available, much shorter. The thirty-six types were obtained from specimens in the Museum of Comparative Zoology.

LABOULBENIA MEXICANA Thaxter. Plate XIX, figs. 1–3.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 171.

Pale amber-colored, the basal cell and mature perithecium more deeply suffused. Perithecium large, straight, thick-walled, the black hyaline-lipped apex abruptly distinguished, nearly symmetrical. Appendages hardly exceeding the perithecium, consisting of two basal cells, the outer giving rise to two branches, an outer usually simple, more deeply suffused, and an inner larger, once or twice branched. From the inner basal cell arise two branches on either side, once or twice successively branched, and bearing a few single antheridia laterally. Receptacle elongate, often abnormally septate, the basal cells of the perithecium large and distinct and forming a broad, more than usually well defined base. Spores, 90–100× 7 μ. Perithecia, 200–240 × 65 μ. Appendages, longest, 220 μ. Total length to tip of perithecium, 500–600 μ.

On *Galerita mexicana* Chaud., *G. nigra* Chev., *G. æquinoctialis* Chaud., Mexico and Nicaragua.

One of the largest species of the genus occurring on the elytra of its hosts, where it is conspicuous from its light color. It is of interest as affording an instance of a transitional condition between the ordinary sessile perithecium and the long-necked forms like those of *L. longicollis*, *L. Kunkeli,* and others. The lower series of perithecial wall-cells are in the present species much shortened about the base, and in some cases show a tendency to form a stout stalk, the sub-basal series occupying almost the whole length of the perithecium. The types examined were derived from specimens in the Museum of Comparative Zoology.

Laboulbenia melanotheca Thaxter. Plate XIX, fig. 4.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 472.

Tinged with pale reddish brown, except the nearly black perithecium. Perithecium long, straight, symmetrical, sub-cylindrical or but slightly inflated, narrowed abruptly to the symmetrical apex, its basal wall-cells elongated to form a neck-like stalk about one-fourth as long as its main body, projecting from the receptacle at an angle to its long axis towards and beyond the appendages. Appendages as in *L. mexicana*, hardly exceeding the perithecium in length, consisting of two basal cells: the outer producing an outer and an inner branch either simple or once branched; the inner producing single branches on either side. Receptacle elongate, expanding very gradually from the base, distally abruptly rounded and contracted below the insertion cell on one side and the neck-like base of the perithecium on the other. Spores, 95 × 5.5 μ. Perithecium, 220–245 × 60–65 μ, its neck-like base about 75 × 30 μ. Receptacle about 515 × 100 μ. Total length to tip of perithecium, 800–835 μ.

On *Galerita mexicana* Chaud., Nicaragua.

This species has been previously referred to by the writer as a possible hybrid between *L. mexicana* and *L. Galeritæ*. It seems on more careful comparison, however, to be abundantly distinct from either. The neck-like base of the perithecium formed from the elongated basal wall-cells of the perithecium lie wholly below the ascogenic cells. The eight types were found on the elytra of their host in company with *L. mexicana*.

Laboulbenia longicollis Thaxter. Plate XIX, figs. 5–8.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 172.

Perithecium becoming suffused with dark brown, straight, thick-walled, often slightly inflated, the apex short, rather large, abruptly distinguished, black, its lips hyaline, turned slightly inward. Appendages consisting of two basal cells, the inner smaller, bearing distally two rounded cells, the upper surface of each blackened and bearing two to five branches, which arise side by side and spreading laterally may be successively and similarly twice branched, the whole having a fan-like habit, the ultimate branches usually one to three in number, either bearing two to three long-necked, straight antheridia, or sterile, somewhat elongate, straight and tapering. The outer basal cell superiorly and externally blackened, the blackened ridge extending obliquely outward and downward nearly to the base, bearing a row of closely set branches of variable number (three to five) which are successively three to five times dichotomously branched, the ultimate branches suffused with brown, straight, slender, tapering, arising from a short characteristically bent basal cell; the basal cells of all the main branches hyaline, slightly inflated inwardly, the septa black, contrasting. Receptacle large, cell V as large or nearly as large as cell IV, the neck of the perithecium about 175 μ in length. Spores, 75 × 6.5 μ. Perithecium, 180–220 × 50–60 μ. Longest appendages, 510 μ. Total length to tip of perithecium, 500–780 μ.

On elytra of *Galerita leptodera* Chaud., Guinea; *Galerita* sp., Liberia, Africa.

The figures of this species were drawn from a small amount of very poor material found on a specimen of *G. leptodera* in the collection of the Cambridge Museum, and do not give a very good idea of the fully developed appendages. Abundant material has since been obtained from specimens of an undetermined Galerita collected by Professor Cook in Liberia. When perfect the species is one of the most striking of the genus in appearance from the copious development of its peculiar branches and its often greatly elongated neck. It is most nearly allied to *L. Galeritæ*, and represents the highest development of this peculiar type. The very numerous specimens examined were found for the most part on the upper surface of the hosts.

LABOULBENIA KUNKELI Thaxter. Plate XVIII, figs. 9–10.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 471; *Thaxteria Kunkelii* Giard. Comptes Rendus Hebdom. d. Séances d. l. Soc. Biol. Sér. IX, Vol. IV, p. 156.

Perithecium blackish brown, nearly opaque, strongly curved outward, sub-cylindrical or somewhat thickened distally, tapering somewhat abruptly to the rather small, nearly truncate tip; the lip-cells distinct, the inner smaller and often slightly more prominent; the lower series of wall-cells elongated to form a hyaline, slender, cylindrical stalk somewhat shorter than the ascigerous portion above it. Appendages consisting of two basal cells; the outer becoming opaque, producing usually two branches, one external, smaller, opaque, one to three times sympodially branched, the other terminal four to nine times sympodially branched like the first in an antero-posterior plane, erect, the branchlets sub-hyaline at the tips, the whole otherwise opaque. The inner appendage consists of a basal cell, from which arise two branches, which, curving outward, diverge on either side, rarely simple, usually furcate above their deeply suffused sub-basal cell; their basal cell several times as large, inflated, sub-hyaline, suffused above and below; the secondary branches sympodially about six times branched, the branchlets like those of the outer appendage. Receptacle long and very slender, cell VI greatly elongated and very narrow, cells III and IV elongate, nearly equal, all the cells punctate or mottled with somewhat darker, transversely elongate patches, cell II often brownish or quite opaque, the opacity involving part of cell I, the remaining cells and sometimes the whole receptacle sub-hyaline or pale yellowish brown. Spores, 185 × 14 μ. Perithecia (sporiferous portion), 360–585 × 75–85 μ; stalk, 320–375 × 60 μ. Appendages, longer, about 500 μ. Receptacle, longer, 1.3 mm. Total length, longer, 2.2 mm.

On *Mormolyce phyllodes* Hagenb., Perak, E. Indies.

The twelve specimens from which the above description is derived were obtained from the specimen of Mormolyce originally examined by Professor Giard and kindly communicated by him, and were taken from the elytra, thorax, and abdomen near the base of the legs. In all these situations, even where mingled with the succeeding species, the present form seems to present sufficiently constant differences to justify its separation from *L. palmella*, with which it was originally confused. Although its habit and the branching and character of its appendages is distinctly peculiar, it should, I think, certainly be referred to the present genus, since it conforms in every essential point to the type structure found throughout the series, and is less peculiarly modified in important points than very many of the remaining species. The dimensions given by Giard are much greater than those of the specimens which I have examined. The smallest specimen among these measures 1.17 mm. in length, while the largest hardly exceeds 2.2 mm. According to Giard, however, specimens of medium size measure 3.132 mm., while larger individuals may reach 4 mm. in length. In any case, however, the species is by far the largest of all the Laboulbeniaceæ, as well as one of the most striking. Both this and the succeeding form appear to be more closely related to *L. longicollis* and what may be called the *Galeritæ* group of the genus than to any other, but apart from the production of a perithecial neck the resemblance is not very close in any case.

Laboulbenia palmella Thaxter. Plate XVIII, figs. 11–20.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 471.

Perithecium nearly straight, almost opaque, sometimes slightly inflated, its tip nearly symmetrical, truncate, its inner walls often having a corrugated appearance, the four lower wall-cells elongated and contracted to form a short stalk below and about one third as long as the ascigerous portion. Appendages rigid and but slightly divergent, arising from two small basal cells: *an outer* which gives rise to a series of two or three opaque branches placed antero-posteriorly, the inner of which alone reaches any considerable size, branching sympodially in an antero-posterior plane, the main axis opaque, successively inflated below the branchlets, which are usually about ten in number, opaque with hyaline tips; *an inner* which gives rise to a single branch on either side, consisting of a sub-cylindrical basal cell, black below, nearly hyaline above and followed by a series of sympodial branchlets like those of the outer appendage. Receptacle short, tapering rapidly to the base, wholly black and opaque with the exception of the whole or a portion of its basal cell, which may be hyaline, and is abruptly bent above the very large hoof-like haustorium or blackened point of attachment. Spores, 150 × 12 μ. Perithecium, 475–580 × 75–110 μ, its neck, 75–150 × 35–65 μ. Receptacle, 300–400 μ, its greatest width, 75–100 μ. Appendages (longest), 500 μ, the branchlets about 225–250 × 7–8 μ. Total length to tip of perithecium, 1–1.1 mm.

On *Mormolyce phyllodes* Hagenb., Perak, Molucca, Java.

The writer is indebted to the late Professor Riley for abundant material of this species found by Mr. Schwarz on a specimen of Mormolyce in the National Museum labelled "Java," as well as to Mr. Beutenmueller, who has kindly sent material derived from a specimen in the Central Park Museum labelled Molucca, and to Professor Giard, who has also generously allowed him to examine the original specimen of Mormolyce from Perak, on which the types of *L. Kunkelii* were associated with the present species. The two species are very closely allied, and were found intermingled toward the base of the elytra, although the smaller was much more abundant on the flattened margins, where it presents the appearance under a hand lens of a grove of little palm-trees. The absence of any transitional forms between the two species seems to render it unlikely that they should prove merely varieties of a single form, while the much smaller size of *L. palmella*, its wholly opaque and short receptacle, straight, short-necked, proportionately stouter perithecium, large hoof-like base, together with the absence of furcation in the main axis of the two lateral branches of its inner appendage, afford sufficient specific differences. The antheridia appear to be represented by flask-shaped bodies borne on short hyaline branches near the tips of the branchlets of the inner appendages. The trichogynes are well developed and more or less copiously branched. The very large amount of material examined indicates that this species is subject to little variation in form and is relatively constant in size.

LABOULBENIA PHEROPSOPHI Thaxter. Plate XX, figs. 13–15.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 170.

Perithecium becoming suffused with blackish brown, straight, the two upper thirds free from the receptacle, rather slender, the outer margin curving abruptly inward to the base of the prominent tip, which is itself bent slightly outward, its base deeply suffused. Outer appendage slightly divergent, somewhat exceeding the perithecium, composed of usually five or six superposed cells, somewhat longer than broad, each of which gives rise externally from its upper half to a single simple short branch, tapering distally, slightly constricted near the base, where it is divided by a blackened septum: insertion-cell rather broad, black, and considerably exceeded externally by the free upper surface of cell IV. Inner appendage smaller and similar or once to twice sub-dichotomously branched above its basal cell, the lower septa blackened. Receptacle normal, cell II usually hyaline, the rest becoming suffused with olive-brown. Spores, $75 \times 4.5\ \mu$. Perithecia, $150 \times 50\ \mu$. External appendage, 100–150 μ, its branches about 50 μ long. Total length to tip of perithecium, 250–500 μ.

On *Pheropsophus æquinoctialis* Linn., and several undetermined species from South America. On *P. marginatus* Dej. var. ? from Zanzibar, and *Pheropsophus sp. indet.*, Liberia, Africa (O. F. Cook).

This form appears to be common on species of Pheropsophus from South America occurring on all parts of the host. In general form it is much like some varieties of *L. elongata*, but is at once separable by its appendages, which are peculiar both in form and method of branching. Among the hosts examined in the collection of the Museum of Comparative Zoology one labelled "*P. marginatus* Dej., var (?)" from Zanzibar, was found to bear a small number of specimens of a Laboulbenia apparently identical with this species except that the antheridia were long with slender necks and borne terminally in pairs on short branches. All the specimens are, however, immature, so that it is impossible to determine whether it possesses other distinctive characters. The types vary somewhat in the relative development of the inner appendage, and the form is often more slender than is represented by the figure. Additional material on Pheropsophus from Liberia collected by Professor Cook has since been obtained, and although the difference above noted in the antheridia is observable in these also they do not seem to be specifically distinct from the South American types, which they otherwise resemble in all respects.

LABOULBENIA PANAGÆI Thaxter. Plate XIX, figs. 17–20.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 170.

Perithecium becoming wholly suffused with blackish brown, straight, thick-walled, cylindrical or slightly inflated, the apex truncate or slightly oblique outward, the outer lip nearly hyaline. Appendages arising opposite the base of the perithecium, consisting of two equally broad basal cells, the inner shorter, bearing each a single cell from which arise from three to five usually simple branches hardly exceeding the perithecium, the lower cells usually inflated, the septa blackened, as is the outer wall of the external basal cell. Receptacle normal, cells III and IV blackened externally or wholly, the suffusion becoming general in older individuals, in which the basal cells of the perithecium may become elongated to form a neck-like base free from the insertion-cell of the appendages, which becomes pushed out quite free from the perithecium by the elongation of cells IV and V. Perithecia, 100–150 × 35–40 μ. Longer appendages, 250–330 μ. Total length to tip of perithecium, 240–330 μ.

On elytra and thorax of *Panagæus crucigerus* Say, and *P. fasciatus* Say, Southern United States.

Specimens occurring upon *P. crucigerus* are decidedly larger and more elongate than those observed upon the smaller species. The form belongs to the group of which *L. Galeritæ* may be taken as the type, in which the lower series of wall-cells tends to form a neck-like base. The inflated cells of the appendages recall those of *L. inflata*, but the two species are not related. The hosts affected are myrmecophilus Carabidæ, inhabiting ants' nests.

LABOULBENIA AUSTRALIENSIS. Plate XIX, figs. 13–16.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 171.

Perithecium as in the preceding species, less deeply suffused and supported in older individuals by a more or less neck-like base. Appendages consisting of two closely united basal cells; the outer much the largest, and giving rise directly to two branches, the outer deeply suffused with olive-brown, the inner once or twice branched, hyaline or with suffused tips. The inner basal cell gives rise to one or two branches, simple or once or twice branched; the insertion-cell black, thick and rather narrow, placed opposite the base of the perithecium. Receptacle normal, except for the eventually neck-like hyaline base of the perithecium, hyaline, becoming suffused with olive-brown, especially in the region of cells II, III, and VI. Spores, 74 × 5.5 μ. Perithecia, 110–148 × 38 μ. Longest appendages, 222 μ. Total length to tip of perithecium, 220–300 μ.

On elytra of *Acrogenys hirsuta* McLean, Australia.

This species appears to be allied to *L. Panagæi*, although the appendages are very different in character. The available material is not abundant and is in rather poor condition, yet the species seems sufficiently well marked.

LABOULBENIA COPTODERÆ Thaxter. Plate XVII, figs. 14–15.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 168.

More or less suffused with faintly olive brown. Perithecium rather large, the apex, which is bent slightly outward, dark, the lateral lips forming a slight angular prominence over the lateral external pore. Appendages two, the outer single, curved outward, blackened externally or wholly opaque, giving rise from its convex side to several successive branches rather irregular in outline and often once branched above their basal cells. Inner appendage consisting of a larger basal cell, which gives rise from its apex on either side to a branch, these two branches in turn successively several times branched, but in a plane at right angles to their own; the lower cells more or less deeply suffused or externally blackened. Receptacle normal, cell II of large diameter. Spores, 40 × 3.5 μ. Perithecia, 100–110 × 33–35 μ. Appendages (longest), 150 μ. Total length to tip of perithecium (average), 200 μ.

On *Coptodera Championi* Bates, Panama.

This species does not appear to be very closely allied to any other form known to me. The appendages are not unbroken in any of the specimens, but appear to be decidedly characteristic in their mode of branching. The knob-like tip of the perithecium and the rather abrupt enlargement of the receptacle above the basal cell also render it peculiar in general appearance. The types were found along the outer margin of the hosts' elytra.

LABOULBENIA TEXANA Thaxter. Plate XX, figs. 16–18.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 172.

Perithecium wholly suffused with blackish brown, short, its upper half free, the outer edge abruptly curved inward to the base of the very prominent apex, the lips of which are brown, slightly pointed. Appendages two, hyaline, almost distinct above the very broad black insertion-cell, the outer broad at the base, tapering distally, strongly curved inward, rather closely septate, a small cell opposite each septum on the convex side, bearing a single short simple branch rather closely septate, hyaline, blackened and constricted at the base, directed obliquely upward. The inner appendage similar, except that a cell is present opposite the first septum at the base on the *inner* side, which bears a single antheridium or a very short fertile branch. Receptacle abruptly expanded above cell II, cells I to VI hyaline, the rest blackish brown; cell V greatly enlarged, so as to throw the appendages outward, separating them by nearly its whole width from the perithecium, its free upper surface forming a right angle with the straight inner margin of the perithecium; cells I and II rather slender. Perithecia, 130–150 × 65 μ. Appendages, 150–160 μ, the branches (longer), 75–100 μ. Length to tip of perithecium, 400 μ. Greatest width, 110 μ.

On *Brachinus* spp., Texas, Guatemala.

One of the most striking of all the species of Laboulbenia, the many peculiarities of which need hardly be pointed out. The tip of the perithecium is not quite so broad in all specimens as it is represented in the figure, but the species seems otherwise very constant. It was found growing on the inferior lateral surface of the prothorax of its host.

Laboulbenia Pachytelis Thaxter. Plate XX, figs. 9–12.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 173.

Perithecium rather small, but slightly exceeding the receptacle, suffused with dark olive-brown, becoming nearly opaque, tapering abruptly to the rather slender blackened tip, which is bent slightly outward, the nearly hyaline lips outwardly oblique. Appendages two; the outer forming a sub-conical body composed of superposed flattened cells four to ten in number, each cell giving rise externally to a single obliquely ascending, rather short, simple, stout, tapering branch, blackened at its base, where a basal cell is cut off by a contrasting black septum. The inner appendage consisting of a small basal and sub-basal cell separated by a blackened septum, the upper giving rise directly to from one to three antheridia or hort sterile branches. Receptacle short or elongate, nearly hyaline or becoming distally suffused with blackish brown, normal, except for the unusual development of cell V, which extends along the inner margin of the perithecium beyond the insertion of the appendages, pushing them outward free from the perithecium. Spores, 66 × 7 μ. Perithecia, 110–150 × 50 μ. Outer appendage, without branches, 90 μ long, the branches (longest), 180 μ. Total length to tip of perithecium, 300–650 μ.

On *Pachyteles mexicanus* Chaud., Mexico.

This striking species is distinguished at once by its outer appendage, which cannot be mistaken for that of any other form. It is rather variable in size as well as in the structure of its receptacle and its relation to the perithecium, which is more commonly that represented in fig. 9. This individual, however, shows an abnormal septation of cell II. Numerous specimens were obtained from the legs and inferior surface of its host.

Laboulbenia Morionis Thaxter. Plate XXI, figs. 19–22.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 169.

Pale straw-colored throughout except for a slight blackish brown shade below the apex of the perithecium. Perithecium small, narrow, its whole inner margin connected with the receptacle, beyond which the rather truncate hyaline tip projects. Appendages inconspicuous, consisting of two basal cells, each of which may bear one to three short branches. Receptacle elongate, slender, expanding but slightly toward its extremity without any abrupt enlargement, the small blackened insertion cell carried outward with the appendages free from the perithecium. Spores, 55 × 5 μ. Appendages, 40–50 μ. Perithecia, 110–125 × 30 μ. Total length to tip of perithecium, 375–425 μ. Greatest width, including perithecium, 50 μ.

On *Morio Georgiæ* Pal., Mexico.

This singular species is distinguished by its narrow habit and small perithecium, which is so closely united to the receptacle and so slightly distinguished from it that it appears at first sight undeveloped. In some specimens the hyaline tips of the lip cells only are free beyond cell V. The appendages are almost obsolete in some instances, and are more reduced than in any other species. It seems undoubtedly allied to the species (*L. Schizogenii* and *L. Clivinæ*) occurring on the allied hosts Clivina and Schizogenius.

LABOULBENIA ASPIDOGLOSSÆ Thaxter. Plate III, figs. 8, 9.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 473.

Perithecium black, almost opaque, rather narrow, the inner margin curved abruptly outward to the rather large apex, the lips very oblique outward. Appendages arising from two basal cells which are nearly equal in size: the outer inflated and separated from the cell above it by a blackened septum, this sub-basal cell roundish, inflated, about as large as the basal cell and giving rise to two branches, an outer and an inner; the outer separated from it by a blackened septum and consisting of a basal cell with three terminal branchlets, the inner of which is deeply and broadly blackened at its base, while the other two are wholly hyaline and fertile; the inner branch from the sub-basal cell has no blackened basal septum and produces several short branchlets bearing numerous antheridia. The inner appendage, like the outer, consists of a roundish or squarish basal cell separated from a sub-basal cell by a blackened septum; the sub-basal cell producing a tuft of short branches bearing at their tips two to four antheridia or becoming more elongate and sterile. Receptacle normal, the two basal cells rather slender, elongate, colorless; the distal cells suffused with blackish brown. Perithecia, 110–120 × 40 μ. Appendages (longest), 240 μ. Total length to tip of perithecium, 333 μ; greatest width, 63 μ.

On *Aspidoglossa subangulata* Chaud., Kansas (M. A. Barber).

A species clearly marked by the peculiarities of its appendages, which, unlike almost all other species of the genus, are fertile without regard to their external or internal origin. In this respect they resemble *L. Clivinæ*, which is found on a closely related host. Otherwise its relationship to other described species is not evident. It occurs rarely on the host mentioned, usually not more than two or three on a given specimen.

LABOULBENIA CLIVINÆ Thaxter. Plate XXI, figs. 16–18.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 169.

Color pale straw-yellow to reddish. Perithecium short, stout, united to the receptacle for three quarters or more of its length; its free portion abruptly tapering to the rather small tip; the lip-cells turned slightly outward, with a blackish suffusion below on the inner side. Appendages united to form a single brush-like organ without any blackened insertion-cell, and consisting of a basal cell which may be single or longitudinally several times divided, followed by a second series of two or more elongate cells placed side by side and bearing distally a series of branches, which, by branching several times successively, form a dense tuft; the ultimate branchlets slender and curved, sterile or fertile. Receptacle moderate, normal, except that cells IV and V become irregularly divided into often numerous (four to eight) cells which vary in form, size, number, and position in different specimens. Spores, 75 × 5 μ. Perithecia, 145–150 × 55–60 μ. Appendage, 110–200 μ. Total length to tip of perithecium (longer), 400 μ.

On *Clivina dentifemorata* Putz., Mexico, and *C. dentipes* Dej., Kansas (Barber).

This species is chiefly remarkable for the union of its appendages at their base into a single body and the abnormal septation of cells IV and V. The appendage is subject to great variation, and in some specimens produces great numbers of antheridia without regard to the position of the branches. It is evidently related to *L. Schizogenii* and its allies, but cannot be confused with any described species. It appears to be a rare form and occurs scattered here and there on various parts of its host.

LABOULBENIA SCHIZOGENII Thaxter. Plate XXI, figs. 13, 15.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 43.

Perithecium blackish brown, deeper below the tip, sometimes nearly opaque, rather short and stout, inwardly inflated and united with the receptacle to its very tip; the hyaline extremities of the lip-cells only free, and bent slightly outward. Appendages arising from a black insertion-cell, consisting of two basal cells, which may be longitudinally several times divided, bearing distally two to several nearly hyaline branches, which may in turn be several times subdichotomously branched, the ultimate branchlets flexuous. Receptacle hyaline or straw colored, sometimes distally suffused with brown, bulging outward prominently and evenly in the region of cells III–V; cell V elongated towards the tip of the perithecium, carrying the insertion-cell outward free from the perithecium. Spores, 70 × 5.5 μ. Perithecia, 100–125 × 50–55 μ. Appendages (longer), 270 μ. Total length to tip of perithecium, 350–450 μ.

On *Schizogenius lineolatus* Say, *S. ferrugineus* Putz., and *Clivina cordata* Putz., New England.

This well marked species is quite rare, never occurring in any great abundance on any single host. It is subject to but slight variations, except in the basal cells of its appendages, although small specimens like that represented by fig. 14 sometimes occur. It is most nearly related to *L. Clivinæ*. The hosts are found commonly under stones on the borders of ponds.

LABOULBENIA PHILONTHI Thaxter. Plate XXII, figs. 26–30.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 174.

Perithecium rather narrow, beginning to taper almost from its base to the somewhat coarse-lipped apex, both margins often almost straight. Appendages consisting of two basal cells, the inner producing several (two to five) branches, which arise by successive proliferations on either side, forming two rows running side by side antero-posteriorly: the outer appendage and the branches of the inner erect, simple, rather rigid, tapering considerably, two or three of the lower septa blackened, the cells between them distinctly inflated. Receptacle hyaline or slightly suffused, normal, except that the basal cell is sometimes hoof-shaped, a portion of it blackened and continuous with the foot. Spores, 52 × 4 μ. Perithecia, 160–185 × 50–70 μ. Appendages (longer), 325 μ. Total length to tip of perithecium, 400–450 μ; longest, 590 μ.

On *Philonthus cunctans* Horn, *P. micans* Grav., *P. debilis* Grav., and numerous undetermined species, New England; *P. æqualis* Horn, Lake Superior; *P. furvus* Nord., California.

This species is by no means uncommon on all parts of its hosts, and may be recognized by the peculiar form of its perithecium and the rigid, erect branches of its appendages, the inflated basal cells of which recall those of *L. inflata*. The insertion-cell is not very deeply blackened, and a hyaline pointed portion is more or less distinct between and below the two basal cells of the appendages. The inner of these cells appears to become divided into a number of cells corresponding to the number of branches which it bears, the partitions running obliquely downward and inward (fig. 27). In some specimens the basal cell of the receptacle is curiously modified in a fashion (fig. 28) similar to that referred to in connection with *Compsomyces verticillatus;* but this hoof-like structure does not appear to be either connected with any special position occupied by the plant or with any peculiarity of the host, and is much less frequent than the normal form. Many species of Philonthus appear to be subject to its attack, whether they occur in moist or dry situations; but the parasite rarely occurs in any great abundance on a single insect. A form allied to this, but in such poor condition that it cannot be described, was found on specimens of *Bledius basalis* Lec., collected in Florida..

LABOULBENIA CURTIPES Thaxter. Plate XVII, figs. 16–19.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 40.

Becoming dark olive-brown except the contrasting hyaline basal cell. Perithecium relatively large, stout, inflated; its upper inner margin bulging strongly, the short, flat tip abruptly distinguished, bent slightly outward, the tips of the lip-cells hyaline. Appendages consisting of an outer and inner basal cell not clearly distinguishable, the outer producing several, the inner many branches sub-dichotomously branched, the ultimate branchlets slender, hyaline, somewhat or hardly exceeding the tip of the perithecium. Receptacle short, sub-triangular, distally more or less opaque, the basal cell hyaline. Spores, 40 × 4 μ. Perithecia, 110–135 × 55 μ. Appendages (longer), 100–125 μ. Total length to tip of perithecium, 200–225 μ.

On *Bembidium bimaculatum* Kirby, Washington.

This species occurs usually on the posterior legs of its host, and is distinguished by the peculiar form of its perithecium, in which are produced great numbers of spores. The appendages are almost invariably broken, and as no young specimens have been examined, their exact origin at the base has not been made out. The outer basal cell bears a branch terminally and probably laterally on its inner side, while a large number of branches usually arise from the inner cell on either side. The basal cells, as well as the lower cells of the branches proceeding from them, are usually so deeply suffused that the structure is obscured. The base of the trichogyne is often persistent, as in figs. 16 and 18.

This species was obtained in considerable numbers from specimens of its host sent me by Miss A. M. Parker.

LABOULBENIA CORNUTA Thaxter. Plate XIII, figs. 28–30.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 476.

Dark blackish brown. Perithecium tapering to a broad blunt apex, from which projects a prominent straight, dark-brown appendage, unicellular, bent abruptly outward from its base, tapering slightly to its nearly hyaline rounded tip. Appendages as in *L. luxurians*, the branches fewer and stouter. Receptacle short, expanding somewhat abruptly above the sub-basal cell, the basal cell becoming narrowed and nearly hyaline towards its base. Perithecium, 85 × 29 μ. Its appendage, 26 × 7 μ. Total length to tip of perithecial appendage, 185 μ; greatest width, 52 μ.

On *Bembidium complanulum* Mann, Washington.

The five types of this singular species are all in poor condition, the appendages being, for the most part, broken; yet it may be recognized without difficulty by the peculiar outgrowth from one of its lip-cells, which distinguishes it from all other species with the exception of *L. Gyrinidarum*, all the lip-cells of which are appendiculate in a somewhat similar fashion. It appears to be peculiar to the single species of Bembidium mentioned, and was found in two instances only on the margin of the right elytron near the base. The outgrowth in all the types proceeds from one of the lip-cells on the right of the pore. The infested beetles were found among material kindly collected for the writer by Miss A. M. Parker.

LABOULBENIA FUMOSA Thaxter. Plate XXII, figs. 9–20.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 12; Saccardo Sylloge, Vol. IX, p. 1132.

Smoky brown with a slight olive tinge. Perithecium becoming almost opaque, tapering rather gradually to the somewhat blunt tip, the lip-cells turned slightly outward. Appendages consisting of two basal cells, the outer followed by a roundish cell which, by successive proliferation on its inner side, gives rise to a number of branches; the first of which, originally terminal, becomes lateral, curved outward, blackened below, and bears several erect, usually simple branchlets. The inner basal cell produces on either side a number of branches, often once or twice branched near the base, nearly straight, erect, tapering; the whole forming a dense tuft. Insertion-cell broad, a hyaline portion projecting up between the two basal cells. Receptacle more or less tinged with brown, paler below, rather stout, never elongate, expanding gradually from below upward. Spores, 55–60 × 5–5.5 μ. Perithecia, 120–130 × 50–75 μ. Appendages, 75–100 μ. Total length to tip of perithecium, 250–325 μ; greatest width, 75–100 μ.

On *Platynus cincticollis* Say, New England.

This species is a common one always occurring at the tips of the elytra and extending to the adjacent apex of the abdomen. It is very closely allied to *L. luxurians*, which, curiously enough, grows in exactly the same position on species of *Bembidium*, but is distinguished by its large size and straight appendages. The basal cell of its outer appendage bears a proliferous cell, the first (originally terminal) branch of which becomes pushed outward by its successive proliferation, and the blackened outer half of this branch from which two to four branchlets arise vertically, is quite characteristic in appearance; the branchlets, however, usually breaking off in mature specimens. The next branch found within this primary branch may resemble it to some extent, but is more often simple, like those which succeed it. The species grows densely crowded, and I have never found it on other species of Platynus commonly associated with the one mentioned, which occurs in very wet situations along brooks, where it hides under stones or in wet rubbish. A species very similar to this occurs in the same situation on the elytra of *Anophthalmus tenuis* Horn in Indiana; but my material is hardly sufficient to form the basis of a diagnosis.

LABOULBENIA LUXURIANS Peyritsch. Plate XXII, figs. 1–8.

Peyritsch, Sitz. d. Wien. Acad. LXVIII, p. 248, Plate II, figs. 10–16; Sorokin Veg. Parasites, Vol. II, p. 416, Plate XXXII, fig. 762; Winter Pilze Deutsch. II, p. 92; Berlese, Malpighia, III, p. 56; Saccardo Sylloge, Vol. VIII, p. 912.

Smoky olive-brown. Perithecium tapering more or less symmetrically from its lower third to the coarse blunt apex, which is not clearly distinguished from it, one of the lip-cells forming a short but distinct pointed median projection. Appendages formed as in *L. fumosa*, but the ultimate branchlets strongly curved towards and often past the perithecium. Receptacle inconspicuously punctate, stout, the basal cell slender and nearly hyaline below, the sub-basal large, as broad as it is long, separated from cells III and VI by nearly equal oblique septa. Spores about 50 × 4.5 μ. Perithecia, 110 × 40 μ. Total length to tip of perithecium, 220 μ.

On *Bembidium varium* Oliv., *B. bipunctatum* Duft., *B. flammulatum* Clairv. Europe. On several species of *Bembidium*, Maine, Connecticut, and Washington.

This small species is not uncommon on Bembidia about ponds and streams, though it is seldom found in great numbers or in very good condition. It grows in a small dense tuft at the tips of the elytra like the preceding species, with which it is closely allied, though readily separated by its curved appendages. The receptacle where it is suffused is rather obscurely punctate.

LABOULBENIA COMPACTA Thaxter. Plate XXII, figs. 23–25.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 37.

More or less suffused, not deeply, with olive-brown. Perithecium straight, tapering gradually to the rather stout tip, the lip-cells not clearly distinguished, turned slightly outward. Appendages as in the preceding species, the insertion broader, the main branches more numerous, the ultimate branchlets forming a dense tuft, rigid, erect, tapering slightly, hardly equalling the tip of the perithecium. Receptacle short and distally very broad, cells III–V about equal in size. Spores, 60 × 4 μ. Perithecium, 110 × 40 μ. Appendages, 90–100 μ. Total length to tip of perithecium, 180–190 μ; greatest width, 65 μ.

On *Bembidium sp.*, Maine and Massachusetts.

This species, though closely allied to *L. luxurians*, seems constant, and is undoubtedly distinct. It may be recognized by its short, stout form and rigid, erect, tapering appendages, which are much more numerous than in its ally. The perithecium and receptacle are also differently shaped and never so deeply colored. It occurs not uncommonly at the base of the posterior pair of legs of its host.

LABOULBENIA CONFUSA Thaxter. Plate XXII, figs. 21, 22.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 476.

Becoming deeply suffused with smoky brown. Perithecium rather small, inwardly inflated, the apex broad, slightly oblique outward. Appendages arising primarily from an inner and outer cell: the outer bearing a second cell which bears terminally a dense tuft of hyaline, flexuous, tapering, more or less divergent branches, which are themselves more or less branched; the inner basal cell becoming several times divided and giving rise to numerous branches densely crowded and similar to the external ones. Receptacle consisting of a long sub-cylindrical basal cell, the sub-basal cell shorter and broader, cells III–V unusually large, causing this portion of the receptacle to bulge outward in an evenly rounded and characteristic fashion. Perithecia, 166 × 55 μ. Appendages (longest), 150 μ. Receptacle, 215 μ long, its basal cell 90–110 × 25–40 μ. Total length to tip of perithecium, 315 μ; greatest width, 75 μ.

On *Bembidium sp.*, Connecticut, Washington.

This species, although based on scanty material, seems quite distinct from its nearest allies, *L. luxurians* and *L. compacta.* Although the general arrangement of the appendages is similar in the present species, their flexuous, divergent, tapering habit is quite different from that of the two forms just mentioned, from which it is also distinguished by its larger size and peculiarly shaped receptacle. It occurs on the legs of a very small metallic-green Bembidium.

Laboulbenia minima Thaxter. Plate XXI, figs. 8–11.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 175.

Punctate, suffused with olive-brown, becoming nearly opaque, except the hyaline basal cell. Perithecium becoming rounded in outline, short, nearly straight, the apex broad, truncate, coarse-lipped, distinctly punctate and nearly opaque at maturity. Appendages arising from a rounded base of insertion, composed of several cells and not distinguished from the receptacle, densely clustered, the lower segments nearly hyaline, oval or rounded, with black septa, the ultimate branches cylindrical, hyaline, strongly curved towards the perithecium. Receptacle very short and stout, the basal cell hyaline, the rest nearly opaque and punctate. Spores, 40 3.5 μ. Perithecia, 80 × 40–48 μ. Appendages (longest), 75 μ. Total length to tip of perithecia, 145–150 μ.

On *Callida pallidipennis* Chaud., Panama.

With the exception of *L. Hageni* this is the smallest species of the genus. The perithecium is proportionately large, sometimes very large, as in fig. 8, the distal portion of the receptacle being much reduced. The appendages resemble to some extent those of *L. luxurians*, and their original relations are clearly shown in fig. 10, the inner basal cell producing a row of branches placed antero-posteriorly on either side. The appendages are usually almost entirely broken off as in fig. 8. Abundant material was obtained from the legs and elytra of a specimen of its host in the Museum of Comparative Zoology.

Laboulbenia Quedii Thaxter. Plate XVII, fig. 7.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 167.

Perithecium rather small, straight, suffused with brownish, darker externally just below the apex, the lips turned outward, the outer hyaline, the inner blackened. Outer appendage consisting of a rather large basal cell bearing two branches, the outer strongly curved outward, usually bearing two secondary branches from its basal cell, suffused with blackish; the inner also similarly branched, the branches long, tapering to a blunt point, often suffused with brown near the base. The inner appendages commonly arise from two basal cells, the inmost smaller and lower in position, each giving rise to a variable number of branches, usually not more than once branched, hyaline except the outer ones, which are larger and usually suffused with brown below. Receptacle elongate. Spores about 55 μ long. Perithecium, 185 × 50 μ. Longest appendages, 370 μ. Total length to tip of perithecium, 630 μ.

On the upper surface of abdomen of *Quedius vernix* Lec., Illinois.

The material on which this species is based is somewhat scanty, only one of the six specimens being mature. In these the insertion-cell, with one exception, does not become wholly blackened, and seems to give rise on the inner side to a small appendiculate cell. The outmost branch of the outer appendage is deeply suffused with brown and bent outward. The large antheridia, of the ordinary form, are borne terminally or laterally, singly or in pairs, on short branchlets. The form of the perithecium, especially at its tip, is peculiar, but more abundant material is much needed to clearly define the species.

LABOULBENIA PROLIFERANS Thaxter. Plate XVII, figs. 8–10 and 23.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 168.

Amber brown, often tinged with olive. Perithecium straight, but slightly inflated, amber brown or olive; the tip deeply blackened below the hyaline tips of the lip-cells, which are turned slightly outward. Appendages consisting of an outer and somewhat smaller inner basal cell, the outer producing invariably two branches, one terminal, simple, erect, slightly flexuous; the other external, sub-terminal, outwardly divergent, long, simple, deeply suffused as a rule near its base; its first septum blackened and constricted in many cases. The inner basal cell bears, as a rule, a single long, slender branch on either side, simple or with a short, fertile branchlet at its base; the antheridia terminal in groups of three to five. Within these primary appendages one to three secondary, simple, elongate appendages are produced by the proliferation of as many cells, which become cut off from the upper inner angle of cell V by oblique septa. Receptacle rather elongate, normal, except for the division and proliferation of cell V, which carries the black insertion-cell out free from the perithecium. Spores, 60–70 × 5.5 μ. Perithecia, 165–170 × 55 μ. Longest appendages, 460 μ. Total length to tip of perithecium, 435–540 μ.

On *Eudema tropicum* Hope, Sierra Leone; *Chlænius tenuicollis* Fabr., Syria; *C. velutinus* Duft., Algeria, *Dolichus* (?) sp., Japan.

This species is readily distinguished from all others by the division and proliferation of cell V between the black insertion-cell and the base of the perithecium. In the specimens on *E. tropicum* the external branch of the outer appendage is more sub-terminal and not blackened at its base, and the perithecia are somewhat more inflated, but there can be no doubt as to the identity of the different forms. The Japanese host is doubtfully determined, and is very likely a Chlænius. For the excellent Algerian material I am again indebted to the kindness of Professor Giard.

Laboulbenia proliferans Thaxter var. liberiana nov. var. Plate III, fig. 7.

Like the type, but somewhat larger, the basal cell of the outer appendage always bearing a slender external branch blackened at its base. Differing from the type from the fact that the inner accessory appendage, which is usually solitary, is borne on an independent black insertion-cell free above the normal one.

On *Eudema sp. indet.*, Liberia, Africa.

This variety, although its peculiarity just described is constant in the considerable number of specimens which have been examined from different individuals of its host, should not, I think, be separated as a distinct species on so comparatively unimportant a character. Like the other species from this locality, the present variety was obtained from hosts collected by Professor Cook, none of which bore specimens of the normal form.

Laboulbenia brachiata Thaxter. Plate XXI, figs. 5–7.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 11; Saccardo Sylloge, Vol. IX, p. 1132.

Hyaline or yellowish, becoming more or less deeply suffused with smoky brown. Perithecium somewhat inflated, becoming smoky brown, deeper below the hyaline tips of the lip-cells. Appendages nearly hyaline or in part suffused with smoky brown, arising from numerous small unmodified insertion-cells, corresponding in number, except the outmost, to secondary divisions of cell V, forming an obliquely superposed series from which the appendages arise in a double row, the inner highest and usually somewhat smaller than those lower and outer in the series. Each appendage consisting of a rather large somewhat inflated basal cell, variable in size, which bears usually two branches simple or once branched, the basal cells of each branch or branchlet slightly inflated, the septa oblique and more or less blackened, the ultimate branchlets long, slender, mostly hyaline, somewhat flexuous and attenuated. Receptacle normal, except for the secondary division of cell V, which results in a superposed series of five to seven cells, decreasing in size from below upward, each opposite an insertion-cell; the lowest insertion-cell opposite a small roundish cell just above the extremity of cell IV. Spores, $60 \times 5\ \mu$. Perithecia, $120–150 \times 50–60\ \mu$. Appendages, longer, $700–750\ \mu$. Total length to tip of perithecium, $400–590\ \mu$.

On *Patrobus longicornis* Say, Maine to Virginia; on *P. tenuis* Lec., Hudson's Bay.

This fine and apparently rare species was first taken in the vicinity of New Haven, and later at York, Maine; but has never been obtained in any quantity. A single specimen of its host taken in Virginia by Mr. Pergande as well as several kindly sent me by Dr. Townsend, collected near Eastport, Me., have yielded additional material, while two specimens of *P. tenuis* from Hudson's Bay in the collection of the Museum of Comparative Zoology were also found to be parasitized. It is apparently subject to little variation, and is distinguished at a glance by the regular secondary division of cell V, which is found in no other species with the exception of *L. fasciculata* Peyr., although an approach to this condition is seen in *L. proliferans*. The antheridia are proportionately very small, and are borne usually in pairs, terminally on short once-celled branchlets (fig. 6). Whether or not the present species should be kept distinct from *L* *fasciculata* it is impossible to say until we have more definite and reliable information concerning Peyritsch's species; but although his description is quite worthless, the two could not be united if one can trust his figures, by reason of the wholly different form of the appendages.

Laboulbenia fasciculata Peyritsch.

Sitz. d. Wien. Acad. Vol. LXVIII, p. 248, Plate I, figs. 8–9; Sorokin, Veg. Paras. Vol. II, p. 416, Plate XXXII, fig. 757; Winter Pilze Deutsch. II, p. 922; Berlese Malpighia, III, p. 56; Saccardo Sylloge, Vol. VIII, p. 911.

"Pale yellowish brown. Appendages numerous, clustered, superposed, colorless, about as long as the perithecium." Length, 370 μ.

On *Chlœnius vestitus* F., Austria.

This species corresponds essentially in structure to the preceding, except that the appendages appear to be different in character and much shorter. As already mentioned, the two may prove to be identical. A single immature example of what appears to be the same form was found on a European specimen of *Omophron limbatum* F., but is not sufficiently perfect either to figure or describe.

Laboulbenia armillaris Berlese.

Malpighia, Vol. III, p. 52 (1889), Plate II, figs. 1–6; Saccardo Sylloge, Vol. VIII, p. 911.

"Pale brownish; with a clavulate stipe, bicellular below, above composed of a number of cells disposed in two longitudinal series, the one bearing the perithecium two-celled, rather short, the other four to six-celled, bearing the pseudoparaphyses, attenuated at its base and terminating in a black, opaque, coriaceous obconical piece, 21 × 14 μ, adhering very firmly to the host by its pointed base, 100 μ long, pale yellowish, filled with granular protoplasm; perithecium subcylindrical or long-ovoid, brown, terminated by a black neck furnished with a pore and a black appendage, having a few black rings, at its apex, 110 × 36–40 μ; pseudoparaphyses dichotomous or laterally almost sympodially branched, terminated by two branchlets pointed at their tips and resembling the claw of a scorpion, divided at the base of the branches by black rings or discs rather thick and coriaceous, very pale yellowish, extending to the tip of the perithecium.

"On *Antennophorus caputcarabis*, Paraguay. Total length, 290–320 × 36–40 μ."

The above description is quoted from the paper of Berlese cited, since the species is unknown to me. As far as can be determined from the published figure and description the species would seem to be related to *L. variabilis* through the multicellular insertion of its appendages. The blackened septa of the latter can hardly be considered very distinctive since they occur in numerous species and the furcate terminal branchlets may very probably be antheridia. The "appendage" below the tip of the perithecium on the inner side is undoubtedly the old base of the trichogyne (cf. Pl. XXI, fig. 12).

The chief interest of the species lies in the fact that it is the only form known to be parasitic on one of the Acarini.

LABOULBENIA VARIABILIS Thaxter. Plate XXI, figs. 1–4.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 38.

Nearly hyaline or suffused, sometimes deeply, with smoky brown. Perithecium straight and rather narrow, or stout and inflated; hyaline or deep smoky-brown, blackened deeply below the hyaline tips of the lip-cells, which are rather coarse and turned slightly outward or nearly straight. Appendages numerous, arising from as many small cells, which take the place of the ordinary insertion-cell, several times sub-dichotomously branched, the lower three or four septa blackened and oblique, the cells between them inflated, the ultimate branchlets straight, tapering, rather slender, erect or slightly divergent. Antheridia borne on short branchlets about the lower portion of the appendages, forming a conical cluster and arising laterally as well as terminally in variable numbers. Receptacle normal, except that cells IV and V may be distally and irregularly divided into a few small cells; short and stout or very elongate, hyaline or wholly or partly suffused with smoky brown, the darker portions punctate. Perithecia, 100 × 225–35 × 125 μ. Appendages, longest, 475–500 μ. Total length to tip of perithecium, 180 μ to 1.65 mm. Spores, 50–75 × 6–7 μ.

On *Anomoglossus pusillus* Say, *Chlænius æstivus* Say, *C. cumatilis* Lec., *C. cursor* Chev., *C. leucoscelis* Chaud., *C. floridanus* Horn, *C. pennsylvanicus* Say, *C. ruficauda* Chaud., *C. sparsus* Lec., *C. texanus* Horn, *C. tricolor* Dej., *C. viridicollis* Reiche, *Omophron americanum* Dej., *Omophron* spp. indet., *Nebria pallipes* Say, *Pterostichus adoxus* Say, *P. luctuosus* Dej., *P. corvinus* Dej., *P. caudicalis* Say, *P. Sayi* Brullé, *Patrobus longicornis* Say, *Platynus extensicollis* Say, Maine to Florida and Texas, Utah, Nebraska, Washington, California, and Mexico. On *Pterostichus* (?) sp., Brazil.

This species is remarkable for its great variation in size, even on the same host; specimens on *Pterostichus caudicalis* measuring over a millimeter and a half, while many individuals on Omophron are less than 200 μ in length. The form and relative position of the perithecium also differs very considerably, and in one instance the tip of the perithecium scarcely exceeds cell V, being united to the receptacle throughout its length. Although their number and length varies very greatly, the species is always readily recognized by the character of the appendages and their insertion on an irregularly cellular base, which is made up partly from divisions of an original single insertion-cell and irregular terminal divisions of cells IV and V. It is a common form, occurring on all parts of its hosts, though preferring definite positions in certain cases, as for example in *Pterostichus luctuosus*, where it is usually found along the edges of the elytra, especially the left near the base. It grows usually scattered, but often rather closely crowded. It is more closely connected with the aquatic forms than any other species, unless perhaps *L. armillaris*, through the irregularity of the cells which form the base of insertion of its appendages, and affords a connecting link which renders the exclusion from the genus of the first mentioned forms quite unwarrantable unless they may prove to present essential variations in their sexual processes.

The material from South America, which was obtained from specimens of a Brazilian *Pterostichus* (?) in the Museum of Comparative Zoology, was found on the legs and on the lower surface of the thorax of the host, and although some of the specimens are peculiar in habit, probably as a result of the position of growth, there seem to be no essential differences between this and the type forms.

LABOULBENIA OBERTHURI Giard. Plate XXII, fig. 39.

Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 477.

Nearly hyaline except the brown or smoke-colored perithecium and sub-basal cell of the receptacle. Perithecium large, inflated towards the base, the narrower distal half abruptly rounded and contracted below a rather narrow apex with protruding lips bent outward; general color dark brown, much deeper below the apex. Appendages numerous, crowded, slender, short, the lower segments inflated, arising as in *L. Guerinii.* Receptacle elongate, consisting of a short curved stout nearly hyaline basal cell, a very long sub-cylindrical sub-basal cell, smoky brown in color, with deeper brown wart-like or scale-like scattered prominences of varying size, the remaining cells normal except that the insertion-cells of the appendages are irregularly divided. Perithecium, 300–315 × 120 μ. Receptacle, 1 mm.–900 μ; its sub-basal cell 370–425 × 65–75 μ. Total length to tip of receptacle, 1.225 mm.

On *Orectogyrus heros* Reg., Madagascar.

This fine species was kindly communicated to the writer by Professor Giard, who dedicated it to M. René Oberthur, its discoverer. It is one of the largest species of the genus, its dimensions being exceeded only by *L. Kunkeli*, *L. palmella,* and the largest forms of *L. variabilis.* Although closely allied to *L. Guerinii* it is abundantly distinct and recognizable at a glance by its peculiarly modified sub-basal cell. The appendages are for the most part broken in the three specimens which constitute the types, and in more perfect examples may prove to be more highly developed than is indicated in the figure. It will be noticed that the latter is drawn with a somewhat lower combination than the other figures of the plate.

LABOULBENIA ORECTOGYRI nov. sp. Plate IV, fig. 5.

Perithecium blackish brown, nearly opaque, rather short and stout, curved, the apex well defined, the lip-cells irregularly prominent. Receptacle long and rather slender, cells I and II much elongated, the former deeply suffused distally, the latter brownish but translucent, the remainder deeply suffused or quite opaque. Appendages numerous in a rather dense tuft, arising as in other aquatic species; hyaline, short, sparingly branched, constricted at the somewhat suffused septa. Perithecia, 140 × 50 μ. Receptacle, 450 μ. Total length, 575 μ. Appendages (longest), 45 μ. Spores (measured in perithecium) about 50 μ.

On *Orectogyros Bedeli* Reg., Bopora, Liberia, Africa (O. F. Cook).

The several types of this form include but a single mature specimen, so that it is uncertain whether the coloration described or the very abrupt curvature of the perithecium are constant characters. The younger specimens, however, are sufficient to show that the appendages are unlike those of either of the other aquatic Laboulbeniæ. The species is most nearly related to *L. Guerinii,* from which it differs in its more numerous and slender appendages as well as in its general form. With the Madagascar species (*L. Oberthuri*), which occurs on a similar host, it cannot be by any possibility confused. The five types were found along the margins of the abdomen beyond the tips of the elytra.

LABOULBENIA GUERINII Robin. Plate XXII, fig. 38.

Robin Hist. Nat. d. Veg. Par. p. 64, Plate X, figs. 1–3; Peyritsch Sitz. d. Wien. Acad. Vol. LXVIII, p. 247; Sorokin, Veg. Paras. Vol. II, p. 413, Plate XXXIII, fig. 780; Winter Die Pilze Deutsch. II, p. 921; Berlese Malpighia, Vol. III, p. 54; Saccardo Sylloge Fung. Vol. VIII, p. 910; Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 176.

Becoming more or less suffused with smoky brown. Perithecium becoming almost opaque, slightly inflated below, its upper half tapering evenly to the blunt apex, the lip-cells straight, the inner forming a slight prominence. Appendages rather numerous, not equalling the tip of the perithecium, once or twice branched; the lower septa blackened, the intervening cells slightly inflated, the insertion-cell apparently divided into several cells which are opaque and indistinguishable. Receptacle distally rather deeply suffused, the basal and sub-basal cells hyaline or translucent, normal, except that cells IV and V may be distally divided into a few small secondary cells. Perithecia, 110 × 55 μ. Appendages, 55 μ. Total length to tip of perithecium, 300 μ. Robin's measurements are, — perithecia, 121 × 45 μ; appendages, 30–55 μ; total length, 430 μ; greatest breadth, 80 μ.

On *Gyretes sericeus* Laboulb., Caracas, Venezuela; on *G. compressus* Lec. (=*G. sinuatus* Lec.) Texas and Illinois.

The North American specimens of this species differ from Robin's account only in their somewhat shorter, stouter habit, which is doubtless due to the fact that they live on a smaller host. The original figures represent slight differences in the appendages, which may well be due to careless reproduction. In other respects the two forms correspond so closely that their identity seems very probable; although more abundant material of both is much to be desired. The species is closely allied to *L. Orectogyri*, as above mentioned, and together with the two preceding and the following species forms a well-marked type within the genus.

The present species occurs, like *L. Guerinii*, along the margins of the elytra of its aquatic host.

LABOULBENIA GYRINIDARUM Thaxter. Plate XXII, figs. 31–37.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 39.

Blackish brown, becoming nearly or quite opaque. Perithecium large, sub-conical or sub-cylindrical, straight, the lip-cells nearly symmetrical, hyaline tipped, each producing a terminal, short, straight, tapering, finger-like, converging outgrowth; often wholly or partly aborted. Appendages hyaline or becoming brownish below, arising in a broad dense tuft from an opaque base, several times irregularly branched, rather closely septate below and constricted at the blackened, often oblique, septa, the cells between which are more or less inflated, the ultimate branchlets slender, hyaline, sub-erect, rarely equalling the tip of the perithecium. Receptacle distally very broad, opaque, abruptly expanded above cell II, cell I usually curved and slender and sometimes elongate. Spores, 90 × 7–8 μ. Perithecia, 190 × 90 μ. Appendages, longer. 100–150 μ. Total length to tip of perithecium, average, 375 μ; longer, 480 μ; greatest breadth, 160 μ.

On *Gyrinus fraternus* Coup, and several undetermined species, New England; on *G. affinis* Aube, and *G. ventralis* Kirby, Middle States; on *G. analis* Say, Missouri; on *G. confinis* Lec., Oregon; on *G. consobrinus* Lec., and *G. plicifer* Lec., California; on *G. urinator* Illig., France.

This remarkable species is by no means uncommon, and is so peculiar that it could by no chance be confused with any other species. A comparison of its younger stages shows that it corresponds in all essentials to the type structure of the genus, there being primarily a single insertion-cell above cells IV and V, which are normally placed (figs. 32–34), while the appendages are developed originally from an inner and outer basal cell (fig. 34), as in species of the usual type. The outer appendage consists at first merely of two or three roundish superposed cells, terminally more or less bilobed, from which a certain number of branchlets may arise; while the primary basal cell of the inner appendage by constant and successive division and proliferation forms the broad base of insertion characteristic of the mature plant. How far cells IV and V and the insertion-cell take part in forming this base through secondary divisions, the opacity of the plant in this region renders uncertain. Cells I and II are sometimes quite elongate and very slender; but as a rule the general habit is such as is represented in fig. 31. The outgrowths from the lip-cells are similar in a way to those occurring in *Stigmatomyces virescens.* They are often irregular in form and frequently are but partially developed. *L. cornuta* is the only other species of the genus having a somewhat similar outgrowth from one only of its lip-cells.

The trichogyne is highly developed (fig. 36) and peculiarly branched; its terminal branchlets tending to grow sideways in between the bases of the appendages. I have thus far been unable to determine the character of the antheridia in this species, and have even been led to suspect that the antherozoids might be exogenous. It is quite uncertain, however, what their nature really is.

The species occurs along the outer margins of both elytra of its host, sometimes extending to the free tip of the abdomen, often growing in dense tufts. The latter, like all the other aquatic forms infested by members of the present genus, is one which swims on the surface of the water, and is very common in ponds and ditches, or along the margins of streams.

TERATOMYCES Thaxter. Plate X, figs. 1–17; Plate II, fig. 1. II. p. 315

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 182; Vol. XXIX, p. 98.

Receptacle consisting of three superposed cells surmounted by a more or less cup-shaped terminal portion divided by vertical and oblique septa into a series of numerous small cells arranged peripherally, from which arise numerous appendages which completely surround the point of origin of the perithecia. Perithecia one to several (five), symmetrical, with single stalk-cells. Appendages consisting of a short series of sympodial branches, bearing sympodial branchlets directed outward, many terminating in sharply-pointed, beak-like, sterile, terminal cells. Antheridia flask-shaped or beak-like cells, free from one another, superposed in a single vertical external row arising from the lower segments of the appendages. Trichogynes copiously branched and septate. Spores once-septate.

This genus presents one of the most curious and clearly defined types among the Laboulbeniaceæ, and although the succeeding genus Diplomyces is evidently its nearest ally, its immediate relations to other genera are very obscure. Owing to the early multiplication of appendiculate cells, the relation of the appendages to the points of origin of the perithecia have not been determined. The exact process by which the terminal series of cells is formed is also not clear. This series does not have the same appearance from all sides, and it appears to be produced as a result of the successive separation of the cells which form it, through the proliferation of the receptacle to the right and left of a common centre within which the perithecia arise. The appendages are unlike those of any other genus, and result from the formation of successive sympodial branches, which are formed in a vertical radial plane. When young they bear the antheridia usually near the base, sometimes alternating irregularly with prominent beak-like branchlets of characteristic appearance, the two forming a single external vertical series (Plate X, figs. 6 and 11). The trichogynes are often very highly developed, varying greatly in their luxuriance in different specimens of the same species. In some cases they are not unlike the appendages in general appearance, the form and mode of branching of their terminal portions being very similar; although in *T. Actobii* there is a very distinct and characteristic modification of the receptive tips of their ultimate branchlets (fig. 17). Fig. 1, Plate II, represents another instance of a highly developed female organ. The perithecia have but four wall-cells in each row, and appear to contain but two ascogenic cells. The species all occur on beetles belonging to the Staphylinidæ, which are found in very wet situations.

TERATOMYCES MIRIFICUS Thaxter. Plate II, fig. 1; Plate X, figs. 4–7.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 182.

Perithecia one to three, pale, becoming reddish or purplish brown, straight, basally inflated, distally sub-cylindrical; tapering abruptly to a symmetrical truncate apex, the stalk-cell cylindrical, often very elongate. Receptacle somewhat flattened, consisting of a small narrow basal cell, brown but more or less translucent; a larger sub-basal cell, which bulges abruptly on one side and is almost wholly opaque except along this prominence: while the distal of its three cells is hyaline, becoming reddish brown, very variable in length, sometimes much longer than the basal and sub-basal cells together. The larger appendages consist of a single long slender flat reddish-brown basal cell, bearing very numerous antheridia or sterile beak-like branchlets in a single vertical row, the terminal branches larger and themselves one to three times branched, the ultimate branchlets often obliquely septate, the septa dark or terminating in pointed beak-like cells. Spores, $40 \times 4\,\mu$. Perithecia, $128–140 \times 22–26\,\mu$. Stalk (longest), $480\,\mu$. Appendages (longest), $185\,\mu$. Receptacle, $110–180\,\mu$, greatest width about $45\,\mu$. Total length to tip of perithecium, $220-750\,\mu$.

On *Acylophorus pronus* Er., Maine and Massachusetts; *A. flavicollis* Sachs., Pennsylvania and Kansas. *A. flavipes* Lec., Florida.

The specimens of this singular species, which were found on the abdomen of *A. flavipes* from Florida, differ from those on the other hosts in their much smaller size, and are not more than half as large as the ordinary form. Yet there seems to be no doubt concerning their identity.

The species is at once distinguished from any of the others by the curious one-sided bulge of the sub-basal cell of its receptacle, which is of course not visible unless the latter lies sidewise. There is great variability in the length and luxuriance of the appendages, which are usually much broken, and in the length of the stalk-cell of the perithecium, which, in mature specimens, is usually several times as long as the perithecium. The third cell of the receptacle is also very variable in length, sometimes decidedly elongate, more commonly short and stout.

The species is usually conspicuous and easily seen at the tip of the abdomen of its host, where it more often occurs in small groups, although it may not infrequently be found on the legs and other portions of the insect. The host *A. pronus* is very common in early summer at the margins of ponds and ditches, hiding in wet moss and rubbish.

TERATOMYCES QUEDIANUS nov. sp. Plate X, fig. 8.

Closely allied to the preceding species. Perithecium larger, sub-cylindrical or very slightly inflated, terminated abruptly by a sub-cylindrical or slightly tapering, bluntly rounded apex. Receptacle elongate, the sub-basal cell long, tapering below and wholly opaque, the blackening involving the base of the cell above it, which is distinctly constricted below the terminal cellular portion. Appendages as in *T. mirificus* much shorter and more thickly beset with brown sharply pointed septate branchlets. Spores, 50–55 × 4.5 μ. Perithecium, 155 × 30 μ. Appendages, longest 150 μ. Receptacle, 160 – 165 μ. Total length to tip of perithecium, 450 μ.

On *Quedius ferox* Lec., Cambridge, Mass.

Fourteen individuals of this form were found on a specimen of its host collected in April, among leaves in swampy woods about Fresh Pond. The species, though very close to *T. mirificus*, seems constant in its differences, and is easily distinguished by the structure of its receptacle, which lacks the prominence peculiar to the last-mentioned species, as well as by the different form of the tip of its perithecium. But two of the specimens are fully mature, and more abundant material would doubtless show much greater range in size than is indicated by the measurements given above.

TERATOMYCES ACTOBII Thaxter. Plate X, figs. 9–17.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 98.

Perithecia one to four, reddish brown, distinctly inflated towards the base, the distal portion symmetrically conical, tapering to a blunt apex; borne on a single short stalk-cell not exceeding the appendages in length, followed by three rather large basal cells disposed as in *T. mirificus*. Receptacle short, nearly symmetrical, tinged with brownish or nearly hyaline, consisting of three superposed cells, the basal small and narrow, the sub-basal squarish, sometimes partly or wholly opaque, the distal large, rounded, and followed by the series of small cells from which arise the numerous appendages which in general resemble those of *T. mirificus*, though proportionately stouter and more intricately branched. Spores, 26 × 3.7 μ. Perithecia, 120–137 × 37 μ. Stalk-cells, 75–100 μ. Longest appendages, 150 μ. Three basal cells of receptacle, 37 × 22 μ.

On *Actobius nanus* Horn., Kittery Point, Maine; Arlington, Mass.

This species occurs with the next on the legs of its host, less frequently on the thorax or abdomen. It differs from *T. mirificus* in the form of its perithecia, which are sub-conical, as well as by its symmetrical receptacle. The short stalk-cell and large basal cells of its perithecia serve also to distinguish it.

TERATOMYCES BREVICAULIS Thaxter. Plate X, figs. 1–3.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 99.

Perithecia one to five, purplish brown, long, slender, straight or slightly curved, cylindrical or slightly inflated near the middle, tapering abruptly to the almost truncate apex, much longer than the stalk and basal cells together, the latter concolorous with the perithecium, the stalk-cell nearly hyaline. Receptacle nearly symmetrical, black and quite opaque, except the partly translucent basal cell; above the opaque portion expanding abruptly to form the broad distal portion, from the numerous small cells of which arise, around the edge, the circle of crowded appendages which surround the perithecia. Larger appendages faintly tinged with brownish purple, consisting of a rather short stout basal cell bearing below, externally, several antheridia and short simple pointed branchlets, above one to several large branches, which in turn branch near their distal ends one to three times successively in the same plane, the basal cells of the branches and primary branchlets usually distally inflated, the ultimate branchlets obliquely septate and blunt, or more often ending in a sharply pointed cell. Spores, 33 × 4 *μ*. Perithecia, 110–120 × 23 *μ*. Stalk-cells, 50 × 15 *μ*. Receptacle, 85 × 50 *μ*. Longest appendages, 100 *μ*.

On *Actobius nanus* Horn, Kittery Point, Maine, and vicinity of Cambridge, Mass.

This species is much rarer than the preceding, which is sometimes associated with it on the abdomen of its host. It is subject to considerable variation in size and in the length of its appendages, but is always readily distinguished by the form of its short-stalked perithecia and the peculiar more or less clavate form of the larger cells of its appendages. The host occurs with *Acylophorus pronus*, but is less common.

DIPLOMYCES Thaxter. Plate X, figs. 18–21.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 468.

Flattened antero-posteriorly, sub-triangular, bilaterally symmetrical, furcate through the presence of a pair of prominent posterior projections. The receptacle consisting of two superposed cells, followed by four cells placed antero-posteriorly in pairs, of which the posterior produce the characteristic prominences; the anterior a pair of short stalked perithecia, near the base of which, within and above, arise two or more pairs of appendages, and eventually a second pair of perithecia. Appendages copiously branched, many of the branchlets terminated by beak-like cells. Spores once-septate.

A singular genus, recalling Teratomyces, to which it seems most nearly allied through the presence of the characteristic terminal beak-like cells of its appendages. The branching of the latter is not, however, sympodial in a single plane, as is the case in Teratomyces, and the general structure of the receptacle is difficult to homologize with that of any other genus. The second pair of perithecia arise in all probability from secondary divisions of the pair of perithecia-bearing cells above described; but the exact structure in this region, behind the stalk-cells of the perithecia, has not been made out satisfactorily. An obliquity in the septum which separates the basal and sub-basal cells sometimes results in the apparent absence of any sub-basal cell.

DIPLOMYCES ACTOBIANUS Thaxter. Plate X, figs. 18–21.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 469.

More or less faintly tinged with brownish. Basal cell of receptacle triangular, sub-basal cell flattened or wedge-shaped; the posterior prominences peculiar to the genus nearly as long as the receptacle itself, slightly divergent, two-celled, the terminal cell twice as long as the basal, tapering slightly towards its rounded extremity. On the anterior side the two perithecigerous cells bear the first pair of perithecia on short stalk-cells bent abruptly upward, divergent, and succeeded by three small cells forming the base of the perithecium. The perithecia rather slender, curved towards the receptacle, so that their tips project beyond it, divergent, rather long and slender, tapering slightly, the apex blunt with ill defined lips, the base of the old trichogyne persisting conspicuously below the pore. Appendages branching, arranged in pairs symmetrically like the perithecia; a smaller one arising just behind the stalk-cell of the perithecium, a much larger one above this followed by a few smaller ones less definitely arranged in the region whence a second pair of perithecia may arise. All the appendages more or less copiously branched, the branchlets terminating in many cases by the slender, curved, and sharply pointed cells characteristic of Teratomyces. Spores, 32 × 2 μ. Perithecia, including stalks, about 75 × 12 μ. Receptacle to tips of prominences, 75 μ. Total length to tip of perithecia, 110 μ. Greatest width, 37 μ.

On *Actobius nanus* Horn, Massachusetts.

This species occurs rather rarely on the abdomen of a large brown variety of *Actobius nanus*, but not as far as has been observed on the normal form. A second species, perhaps distinct from the present, was found on the abdomen of a small Philonthus, and is distinguished by the presence of slender thread-like branches from the larger appendages. Sufficient material of this form was not, however, obtained, and it may prove to be nothing more than a variety of the one above described.

RHACHOMYCES Thaxter. Plates II, IV, X–XII. II. p. 420

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 468; *Acanthomyces* Thaxter (nec Lebert), l. c. Vol. XXVII, p. 36.

Receptacle consisting of a single basal cell surmounted by a more or less elongated body composed on one side of a primary series of superposed nearly equal cells; on the opposite side of a second series, of smaller and more numerous cells bearing large numbers of bristle-like appendages, extending up to and more or less surrounding the base of the perithecium. Perithecia produced laterally near the tip of the receptacle, at maturity apparently terminal, stalked or nearly sessile, symmetrical. Spores once-septate. Antheridial cells single, terminal on short stalks.

This well-defined and characteristic genus was first described by me under the name Acanthomyces, in ignorance of the fact that it had already been used by Lebert in a zoological paper (Zeitschrift für Wissenschaftliche Zoologie, 1858, Vol. IX., p. 447) for an entomogenous fungus probably identical with *Isaria sphingum.* The name Rhachomyces has been substituted as suggesting the resemblance which the main axis of the plant bears to a vertebral column, a resemblance sometimes made more striking by the presence of a sigmoid curve (Plate XII, fig. 6).

The eight species which compose the genus are very constant in their essential characters, and vary chiefly as regards the number of cells composing the main axis of the receptacle, and in the number and length of the appendages. Extremes in these respects are represented by the two species *R. pilosellus* (Plate XII, figs. 12–13) and *R. longissimus* (fig. 4). I have been unable to obtain a series of young specimens to illustrate the complete development of the main axis of the receptacle; but from the specimens available it is evident that the main body of the latter arises as a lateral outgrowth, somewhat in the same manner and in the same position that the perithecium of genera like Laboulbenia or Stigmatomyces originates. The youngest condition observed consists of a simple series of superposed cells, the terminal portion of which, all above the sub-basal cell, becoming blackened and modified to form the lowest member of the series of appendages, which are characteristic of all the species of this genus. It is then as an outgrowth from the sub-basal cell that all the remainder of the plant is developed. The first indication of this development is seen in fig. 10, Plate XII, in which an oblique partition has divided the sub-basal cell into an upper and a lower portion, and it is from the subsequent divisions of this upper portion that the body of the receptacle, including the male and female organs, arises. The axis, as in so many other instances among the Laboulbeniaceæ, more especially in the case of their appendages, seems to consist in reality of a series of sympodial branches, while the appendages and antheridial branchlets arise from small cells, which become laterally separated on one side. The appendages are arranged in two vertical rows throughout the greater portion of the axis, thus succeeding one another in pairs as a rule; and between them and for the most part wholly concealed by them are borne sterile or antheridial branchlets; the latter, so far as known, also produced in pairs, appressed in habit, each bearing a single terminal, flask-shaped antheridium of the usual form (figs. 18–19). The perithecium seems to arise from one of the sub-terminal cells of the main axis between the appendages, which may at maturity be present around its base. The terminal portion of the axis often extends normally some distance beyond the base of the perithecium, as in *R. furcatus;* while in other cases it may be very short, as in *R. lasiophorus;* and it is from this portion that the proliferation described below takes place.

The receptacle normally bears but a single perithecium, but in exceptional cases two may be formed side by side from the same cell (Plate X, fig. 22). When, however, the trichogyne has for any reason failed to become fertilized, or the perithecium which was first formed is injured or becomes infertile, a terminal proliferation of the axis takes place, and from this proliferation is produced sub-terminally a second perithecium, as in fig. 2, Plate XII. This process may be once or even twice repeated, as in fig. 14; but in any case the phenomenon is not to be considered a normal occurrence. It may be mentioned as a curious fact that the number of cells which compose one of these proliferations in a given species seems to be more or less constant, as indicated in the figure last cited.

The perithecium is but slightly flattened, its cell-rows composed of four cells, and contains four ascogenic cells at maturity. The trichogyne, which has been observed in a few instances, is rather short and sparingly branched and septate (Plate II, fig. 6). The sterile appendages are very characteristic in appearance, being invariably simple, usually quite opaque, except along their upper margin, and more or less distinctly septate.

The species occur on beetles belonging to the Carabidæ and Staphylinidæ, two of them on cave beetles, and are found in Europe, Africa, and North America, including Mexico.

RHACHOMYCES LASIOPHORUS Thaxter. Plate II, fig. 6; Plate XII, figs. 7–11 and 17–19.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 467; *Acanthomyces lasiophorus* Thaxter l. c. Vol. XXVII, p. 37.

More or less suffused with blackish brown. Perithecium sessile, becoming brown, somewhat inflated, nearly symmetrical, tapering to a rather blunt apex. Appendages arranged in two rows of larger bristle-like members, hyaline-tipped, blackish below, running from the sub-basal cell to the apex of the receptacle, where they surround the base of the perithecium, which exceeds them by about half or one-third its length: from the cells of the receptacle between these two rows arise smaller appendages, which become more numerous towards its extremity. Receptacle slender at the base, expanding upward, consisting of a main axis of about twelve superposed vertebra-like cells, at first hyaline, becoming blackish, and of a series of smaller cells almost completely concealed by the appendages. Spores, 30 × 3 μ. Perithecia, 140–145 × 50 μ. Larger appendages, 75–90 μ. Receptacle, 175 μ.

On *Atranus pubescens* Dej. New Hartford, Connecticut; Stony Brook, Mass.; Virginia. On *Badister micans* Lec., *Acupalpus carus* Lec., and *gen. indet.*, Kittery Point, Maine.

A few specimens of a species apparently identical with this were found on a small species of Platynus captured in swampy woods at Kittery, but these as well as the host have been unluckily lost. The usual host of the species is quite rare, and I have found but four specimens, two of which were infested. The Virginia specimens were collected near Washington by Mr. Pergande. The compact form, brown inflated perithecium, short, stout, and closely appressed appendages serve to distinguish the species from its allies.

Within the past year further material of this form has been collected at Kittery on the two additional hosts above mentioned, from which it is apparent that the species is subject to considerable variations in size and form. Figures 17–19 of Plate XII were drawn from this material, and fig. 17 represents the greatest divergence from the type observed in any of the mature individuals.

RHACHOMYCES SPELUNCALIS Thaxter. Plate XI, figs. 23–25.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 468.

Perithecium more or less deeply suffused with brown; short and stout, with a broad, bluntly rounded apex. Receptacle slender, the main axis constricted strongly at the septa, its cells rather small, the basal slender and cylindrical; the remainder, about nine in number, all evenly and rather deeply suffused with brown, and more or less uniform in size. Appendages mostly opaque, more or less rigid, hyaline-tipped, those surrounding the base of the perithecium hardly equalling it in length, a few lower on the receptacle exceeding its apex by the whole length of the plant; of the shorter median appendages some are terminated by a peculiarly modified, partly hyaline antheridial cell, the neck-like tip of which curves strongly outward, terminating bluntly. Perithecia, 90 × 37 μ. Receptacle about 110 μ (when not proliferous). Longest appendages, 300 μ. Total length to tip of perithecium, 185 μ to 260 μ (in proliferous forms).

On *Anophthalmus pusio* Horn, West Virginia.

The smallest species of the genus, more nearly allied to *R. lasiophorus* in the form of its perithecium and the disposition of its appendages around the base of the latter, but differing in its slender form, longer and more slender appendages and irregularly constricted receptacle. A small number of specimens were found growing near the tips of the elytra of its host, a blind cave beetle. The curved cells borne on short branches (fig. 25) are conspicuous in some specimens, and are undoubtedly antheridia.

Rhachomyces longissimus Thaxter. Plate XII, fig. 4–5.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 467; *Acanthomyces longissimus* Thaxter l. c. Vol. XXVIII, p. 176.

Perithecium brown, darker at the blunt apex, slightly inflated, its two lower thirds almost completely surrounded by a series of appendages arising from its base. Receptacle very long and slender, slightly flexuous, its main axis consisting of about thirty superposed cells deeply suffused with blackish brown, lighter at the septa. Appendages very numerous, externally opaque, internally more or less hyaline, short, slender, straight, appressed; a few curved, projecting outward on either side in successive pairs. Spores, 60 × 4 μ. Perithecia, 185 × 55 μ. Appendages about 110 μ long, those at the base of the perithecium about 165 μ. Receptacle slightly exceeding a millimeter in length by 30 μ broad.

On *Colpodes evanescens* Bates, Guatemala.

One of the largest of all the Laboulbeniaceæ found on the elytra of a small Colpodes in the collection of the Museum at Cambridge. Apart from its great size it is readily distinguished by the curious disposition in pairs of certain of its slender appendages.

Rhachomyces hypogæus Thaxter. Plate XII, fig. 6.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 467. *Acanthomyces hypogæus* Thaxter l. c. Vol. XXVIII, p. 177.

Perithecium nearly sessile, terminal, pale straw-colored, hardly inflated, continuing the sigmoid curve of the receptacle, its blunt apex exceeding the tips of the appendages by about half its length. Receptacle uniformly pale straw-colored, bent in a sigmoid curve, the base slender, the remaining portion stout, the main axis consisting of about eighteen superposed cells with very oblique septa, the appendiculate cells unusually large, their bases externally distinct. Appendages numerous, closely set, appressed, slightly curved inward, deep brown, the tips paler. Perithecium, 145 × 37 μ. Appendages, 110–150 μ. Receptacle, 340 × 37 μ.

On *Anophthalmus Bilimeki* Sturm., Carniolia, Austria.

One mature and several immature specimens of this fine species were found on the elytra of a specimen of its host in the collection of the Cambridge Museum. It is at once distinguished by its sigmoid outline, colorless receptacle, and appressed, incurved, short appendages, as well as by the unusual development of its appendiculate cells.

RHACHOMYCES ARBUSCULUS nov. sp. Plate IV, figs. 6–7.

Perithecium pale straw-colored, long and slender, tapering slightly and gradually towards the bluntly rounded apex, which is suffused with brown; the stalk-cell short, for the most part hidden by the appendages. Receptacle slender, curved or slightly sigmoid; the cells of the main axis, about twenty to twenty-five in number, more or less deeply suffused with blackish brown; the septa rather oblique; the apex distinct beyond the insertion of the stalk-cell of the perithecium. Appendages numerous, externally black and opaque, the inner margin more or less transparent, stiff, short, their tips more or less prominently and abruptly recurved, arising from all except the basal cell of the receptacle, and projecting obliquely upward; those at the base of the perithecium somewhat longer and more prominently curved away from its base on either side. Perithecium, 170–190 × 35–38 μ. Spores about 50 μ long (measured in the perithecium). Receptacle, 200–325 μ long. Appendages, 85–100 μ.

On an undetermined staphylinid allied to Lathrobium, Mt. Coffee, Liberia, Africa (O. F. Cook).

This species corresponds in all respects to the type so closely adhered to in all the other species of this genus, from which it may be readily distinguished by its long slender form and very numerous short recurved appendages. The types, which are in excellent condition, were found on the abdomen of the host, a small riparian staphylinid.

RHACHOMYCES FURCATUS Thaxter. Plate XII, figs. 1–3.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 467; *Acanthomyces furcatus* Thaxter l. c. Vol. XXVIII, p. 177.

Perithecium more or less suffused with brownish, straight, slightly inflated at the base, tapering gradually to the apex, borne on a stout and well marked stalk-cell. Receptacle more or less tinged with brownish, its main axis consisting of about twelve superposed cells, continued by a more slender prolongation beyond the base of the perithecium, this prolongation sometimes forming a second successive main axis terminated by a second perithecium and continued by a similar prolongation beyond the base of this second perithecium, which arises on the side of the general axis nearly opposite to that which bears the first. Appendages dark brown, opaque, stout, rigid, nearly straight or slightly curved outward, the longest not equalling the tip of the perithecium. Spores, 48 × 4 μ. Perithecia, 160–185 × 48–55 μ. Appendages (longest) about 150 μ. Total length to tip of receptacle about 360 μ. Main body of receptacle about 220 μ long. Total length when two perithecia present (longest), 550–600 μ.

On *Othius fulvipennis* Fab., Germany.

A number of specimens of this large and well-marked species were found on the abdomen of a specimen of its host in the collection of the Museum at Cambridge. It is characterized by the conspicuous prolongation of its receptacle beyond the base of the perithecium, which gives it a more or less furcate habit. The perithecium is large and its stalk-cell more highly developed than that of any other species.

RHACHOMYCES LATHROBII Thaxter. Plate X, figs. 22–23.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 467; *Acanthomyces Lathrobii* Thaxter l. c. Vol. XXVIII, p. 178.

Perithecium becoming slightly suffused with brown, its blunt conical tip dark brown, contrasting; rather slender, slightly inflated towards the base, borne on a short stalk-cell more or less concealed. Receptacle consisting usually of eight to ten superposed cells, forming the main axis and deeply suffused with blackish brown except at the nearly hyaline septa. Appendages large, curved, almost opaque, nearly equalling, often greatly exceeding, the tip of the perithecium. Spores about 50 × 4 μ. Perithecia, 100–130 × 35–40 μ. Appendages (longer), 150–450 μ. Receptacle (average), 110 μ long.

On abdomen of *Lathrobium longiusculum* Grav., New Hampshire and Lake Superior; *Lathrobium* sp., Pennsylvania.

The appendages of the specimens from New Hampshire are constantly far longer than those of the Lake Superior specimens, resembling *A. pilosellus* in this respect. The two forms seem otherwise identical, and are distinguished from *A. pilosellus* by the characteristically brown-tipped perithecium, longer receptacle, and more densely crowded appendages. The infested hosts were all found in the collection of the Museum at Cambridge.

RHACHOMYCES PILOSELLUS Thaxter. Plate XII, figs. 12–15.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 467; *Laboulbenia pilosella* Robin, Traité du Microscope, p. 912, fig. 285 (1871); *Acanthomyces brevipes* Thaxter, Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 177.

Perithecium suffused with reddish brown, subfusiform with a distinct stout stalk-cell. Receptacle very short, the main axis consisting usually of five superposed cells, with a short prolongation beyond the base of the perithecium, normally of not more than three or four cells, the cells all pale yellowish or with brown suffusions, the septa in all cases usually hyaline. Appendages few in number, opaque or nearly so, scattered, some of them very long, curved, and greatly exceeding the tip of the receptacle. Spores, 55 × 4 μ. Perithecium, 150–165 × 45–55 μ. Receptacle, main body about 75 × 30 μ, its prolongation about 35–40 μ. Stalk of perithecium about 40 × 30 μ. Appendages (longest), 375–500 μ.

On *Lathrobium fulvipenne* Grav., Germany.

This small species is distinguished from its near ally *R. Lathrobii*, by its shorter and differently shaped receptacle, concolorous perithecium, and scattered appendages. The specimens examined were obtained from material of its host in the collection of the Museum at Cambridge labelled "Germany," and were found growing on the insect's abdomen. I have been unable to discover any diagnosis of this species in Robin's "Traité" beyond the description of the plate, and was unaware that no description existed when I referred my own species to this form in the paper cited above. Although the name *R. brevipes* might very properly be retained, in view of the lack of any proper description, it seems superfluous to complicate the synonymy further, and it must be confessed that Robin's figures, with their description, constitute quite as satisfactory a basis for determination as is afforded in the case of many other species.

CHÆTOMYCES Thaxter. Plate XI, figs. 20–22. II-p.429

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 178.

Receptacle consisting of a slender rigid series of superposed cells from which arise successively in a unilateral series the appendages, and one, rarely two, perithecia. Perithecium flattened stalked. Appendages one from each cell, simple or branched, produced one or more below the origin of the perithecium, the rest above it. Spores once-septate.

This well-marked type differs from other genera, from the fact that as many as three of the cells of the receptacle lying below the origin of the perithecia may give rise to appendages apparently fertile. The lowest of the latter which form the series above the perithecium, also seem to be fertile, producing a small number (one or two) of rather slender flask-shaped cells; but no discharge of antherozoids has been observed from them. The cells immediately above the origin of the perithecia bear no appendages, but the lowest sometimes produces a second perithecium. The perithecium appears to have four cells in each series of wall-cells, but it has not been possible to determine this beyond question.

CHÆTOMYCES PINOPHILI Thaxter. Plate XI, figs. 20–22.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 179.

Perithecium suffused with purplish, more deeply at the base and along its inner half, long, slender; the inner margin nearly straight, the outer curving inward distally to the prominent somewhat angularly inflated tip; the stalk-cells bent upward at the base, so that the axis of the perithecium is nearly parallel to that of the receptacle, the lower short and narrow, the upper becoming distally as broad as the perithecium, the basal cells of which are not distinguished from it and are similarly suffused with purplish. Receptacle bristle-like, composed of about fourteen superposed sub-cylindrical or somewhat flattened cells, almost or quite opaque and indistinguishable, the series usually bent backward at the base and, more abruptly, at the apex. Of these cells the three (rarely four) basal ones bear no appendages; above these one to three cells may bear fertile appendages, and are in turn succeeded by one, rarely two cells, from which are produced single perithecia; above these follow two to four cells without appendages, while the series is completed by five or six distal cells bearing short stout sparingly branched tapering hyaline, mostly sterile appendages. Fertile appendages hyaline, sparingly branched, the antheridia irregularly placed. Spores very slender and sharply pointed, $37 \times 1.5–2\,\mu$. Perithecia (including basal cells) $90–130 \times 22\,\mu$; stalk-cells about $30\,\mu$ long by $18.5–22\,\mu$ distally, $11\,\mu$ wide at base. Total length of receptacle $150–165 \times 7.5–8\,\mu$. Appendages (longer) about $50–60\,\mu$.

On *Pinophilus latipes* Er., Southern States.

A specimen of this host bearing the parasite in considerable numbers on the under side of its abdomen was found in the Leconte collection of Coleoptera. The fungus under a hand lens looks like a stiff slender bristle, and might readily be overlooked even when present in considerable numbers. The material, though abundant, contained no very young individuals, so that the early development is unknown.

SPHALEROMYCES Thaxter. Plates III and XI. II. p. 323

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 95.

Receptacle consisting of two superposed cells, the upper bearing the appendage laterally, and the stalk-cell of the perithecium terminally. Perithecium asymmetrical, each series of wall-cells composed of five cells; the apex somewhat pointed, the stalk-cell free. Appendage consisting of a basal cell bearing a series of superposed cells, each of which gives rise from its inner upper angle to a single short septate simple antheridial branch. Spores once-septate. Ascogenic cell solitary.

This somewhat insignificant genus is perhaps related to Compsomyces, as may be indicated by the structure of its perithecium, the wall-cells of which are unusually numerous. The peculiar disposition of the canal cells near the tip has been already referred to (p. 231). The trichogyne has been observed in a single specimen only, which was badly broken. It appears to be filamentous and branched. Owing to its rarity the early stages have not been observed. In a single young specimen of *S. Lathrobii* (Plate XI, fig. 19) a perfect appendage was obtained, showing the sub-terminal origin of the flask-shaped antheridia, and the presence of a peculiar spine at the base of the sub-terminal cell, to which reference has been made above (p. 209). Although marked by no great peculiarities, the generic type is clearly defined by the two very distinct species.

SPHALEROMYCES LATHROBII, Thaxter. Plate XI, figs. 2–5, 19; Plate III, figs. 1–2.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 95.

Wholly hyaline or faintly yellowish. Perithecium rather slender, slightly inflated toward the base, tapering to the somewhat pointed apex which is bent inward; the dividing lines between the wall-cells indicated by successive ridges, the distal more prominent; the stalk-cell short, the basal cells rather large. Receptacle consisting of two obliquely superposed cells, the upper bearing the stalk-cell of the perithecium distally and the basal cell of the appendage laterally. Appendage borne on a large basal cell connected on its inner side with the distal cell of the receptacle and a portion of the stalk-cell of the perithecium, its exterior wall usually much thickened so as to form a more or less distinct rounded prominence at the base of the appendage proper, which consists of a series of four or five obliquely superposed cells diminishing in size towards its apex, from each of which arises on the inner side a single branch; the branches directed obliquely upward and forming a single series, septate, cylindrical, simple or bearing near their tips single short flask-shaped antheridia. Spores, 35 × 3–3.5 μ. Perithecia, 100 × 22 μ–140 × 36 μ. Total length to tip of perithecium, 160–240 μ. Total length to tip of distal branch of appendage, 110–166 μ. Receptacle, 38–45 μ long.

On *Lathrobium nitidulum* Lec. and *L. punctulatum* Lec., Kittery Point, Maine; on *Lathrobium* spp. indet. Arlington, Mass., Lake Superior.

This species seems to be a rare one, and inhabits the legs and abdomen of its host, where, owing to its small size and pale color, it is detected with difficulty. Specimens on *L. nitidulum* are distinctly smaller than those on the second host, but otherwise there seems to be little variation in the rather insufficient material examined.

SPHALEROMYCES OCCIDENTALIS, Thaxter. Plate XI, fig. 1.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 469.

More or less evenly tinged with brownish. Perithecium large, subfusiform, with faintly defined ridges at the divisions between the wall-cells, the apex made externally oblique through the outgrowth of one of the lip-cells, which forms a pointed projection beyond the pore; the stalk-cell wholly free, tapering to a narrow base, and about as long as the receptacle proper. Receptacle small, pointed below, its sub-basal cell united throughout its length to the basal cell of the appendage, its basal and sub-basal cells separated by a horizontal septum. The appendage straight, rigid, tapering, composed of a series of usually four superposed cells separated by oblique partitions, and bearing short branches with flask-shaped antheridia from their upper inner angles. Perithecia, 200 × 45 μ. Length to tip of perithecia, 350 μ. Length to tip of appendage, 200 μ. Length of receptacle, 55 μ.

On *Pinophilus densus* Lec., Utah.

The present form was found on the abdomen of its host, and is readily distinguished from *S. Lathrobii* by the peculiarly modified tip of its perithecium, as well as by other important differences. The scanty material examined was obtained from specimens of the host (a staphylinid beetle living under bark(?)) contained in the Le Conte collection.

COMPSOMYCES Thaxter. Plate XI. II. p. 428

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 96; *Cantharomyces* Thaxter pro parte, l. c. Vol. XXIV, p. 9.

Receptacle consisting of two superposed cells, the distal bearing from its extremity several appendages and one, rarely two, stalked perithecia. Appendages sterile or fertile, simple or branched, septate; the fertile ones bearing one or more single one-celled antheridia, sessile at the extremities of the successive cells, which form the main axis of the appendage. Perithecium symmetrical, conical, borne on two superposed stalk-cells, the lower of which bears one, rarely two, terminal simple appendages. Asci eight-spored. Spores once-septate. Trichogyne copiously branched, the receptive tips coiled in a close spiral.

This genus, though closely related to and possibly identical with Moschomyces, has no other near allies, unless it be Sphaleromyces, and its position in the series is very doubtful. With the two exceptions mentioned, it differs from other genera with endogenous antherozoids in having five cells in each series of perithecial wall-cells. Moschomyces also is the only other instance in which the peculiar appendiculate basal stalk-cell characteristic of this genus is found. The trichogyne when well developed, as in fig. 9, is the most remarkable structure of its kind in the whole family, its spiral terminations being invariably present and of very regular form. It is possible that the lower stalk-cell of the perithecium is morphologically a part of the receptacle and not homologous with the ordinary stalk-cells. Its early derivation, however, has not been determined.

Compsomyces verticillatus Thaxter. Plate XI, figs. 6–15.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 97; *Cantharomyces verticillatus* Thaxter l. c. Vol. XXIV, p. 9.

Nearly hyaline, becoming pale straw-yellow. Perithecium, very rarely more than one, not distinguished from its basal cells, inflated below, its slender, terminal portion tapering gradually to the blunt symmetrical apex, the eight basal and sub-basal wall-cells producing a corresponding number of more or less conspicuous prominences. Receptacle two-celled, the basal cell sometimes furnished with a partly blackened outgrowth from its base. Appendages two or three to eight or more, arising sub-verticillately from the sub-basal cell, simple or sparingly branched, the cells short and usually distally expanded. Spores, 20–22 × 3 μ. Perithecia, 90–150 × 20–35 μ; its two stalk-cells (longest), 185 μ. Receptacle, 18–80 μ. Total length to tip of perithecium, 140–400 μ.

On *Sunius longiusculus* Mann., Anna, Illinois and Kittery Point, Maine.

This graceful form was first received from Prof. S. A. Forbes, who kindly sent me two mounted specimens from Illinois, on which the original description was based. These specimens, however, were so imperfect that its really essential characters (the form and position of the antheridia) were not made out. Its general structure, however, seemed so like that of *Cantharomyces Bledii*, received at the same time from the same source, that the two were united under a common generic name. Later, more abundant material of *C. Bledii* and the discovery of two additional species offered an opportunity for a more exact characterization of the genus Cantharomyces on a basis of these three species, the *C. verticillatus* of my first paper being still in doubt until an abundance of material was obtained at Kittery.

The species varies very considerably in size according to its position on the host, specimens on the elytra and near the tips of the legs being often very small. The length of the receptacle also varies very considerably, and the hoof-like modification of the foot (fig. 13), which finds a parallel only in *Laboulbenia Philonthi* (Plate XXII, fig. 28) sometimes occurs. The rounded projections from the lower cells of the perithecial wall (fig. 11), are also very variable in form and are often hardly apparent. In very rare cases the lower stalk-cell of the perithecium may bear two appendages from its distal end, which though almost invariably simple, may sometimes produce short branches. Two perithecia (fig. 8) have been observed in only two instances. The antheridia (fig. 14) are produced in small numbers, one or two from the distal ends of some of the lower cells of the appendages.

The hosts are common in dry rubbish in cultivated fields.

MOSCHOMYCES Thaxter. Plate XI, figs. 16–18 and 26. II. p. 429

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 97.

Receptacle composed of a sucker-like compacted mass of parenchymatous cells penetrating the softer chitin of the host and giving rise above to numerous free cells from the distal ends of which are produced solitary stalked perithecia and appendages. Perithecium very large, sub-conical, pointed, the apex symmetrical, borne on two simple superposed stalk-cells followed by three small basal cells; the basal stalk-cell bearing from its distal end a single simple sterile appendage. Appendages septate, sparingly branched or simple, the fertile ones stouter, bearing the antheridia on short branchlets. Asci sub-cylindrical, eight-spored, arising in great numbers and in many rows from a single ascogenic cell. Spores minute, once-septate.

This genus, although at first sight so remarkably distinguished from all others by its habit of penetrating its host and by a cellular base, may yet prove merely a well-marked species of the preceding genus. This suggestion is made on the supposition that an "individual" such as is represented by fig. 16 is in reality an aggregation of as many individuals as there are cells in its penetrating base. The spores are discharged in enormous numbers from the perithecium, and show a marked tendency to adhere in masses (fig. 18). It is a question, therefore, whether the "individual" as figured does not represent the product of one of these masses and not the product of a single spore. Apart from this apparently compound habit, the essential characters of the genus are very similar to those of Compsomyces. If this supposition is correct, the sucker-like base is morphologically a compound foot, while the "numerous free cells" above described as rising from it represent the sub-basal cells of the true receptacle. Whether the latter has a basal cell distinct from the intruded cells cannot be seen in the specimens examined.

The antheridia are flask-shaped cells borne at the tips of short branches, which arise near the ends of the stouter appendages (fig. 26), and are unlike those of Compsomyces. In one specimen, unfortunately destroyed, several trichogynes were observed, which though not as luxuriant as is often the case in Compsomyces, were terminated by the same regularly coiled spiral branchlets. As far as can be determined, the asci arise from a single ascogenic centre, apparently a single large cell, but possibly a coherent group of cells. The asci (fig. 17) are sub-cylindrical, with a long, slender pedicel (partly broken in the figure), eight-spored and produced in very great numbers. The ascus mass is a most remarkable object when viewed in fresh material under the microscope. What may be called the dorsal view of this mass (represented in the second perithecium from the right in fig. 16) shows with great distinctness the round ends of a multitude of asci with their contained spores, projecting towards the observer and gradually losing themselves above in the mass of spores, which must be counted in a single perithecium almost by thousands. The structure of the perithecium is, like that of Compsomyces, unusual, there being five transverse series of wall-cells, the lower four marked by singular ridges.

Moschomyces insignis Thaxter. Plate XI, figs. 16–19.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 97.

Perithecium pale straw-colored, becoming tinged with brown, the lower portion slightly inflated and abruptly contracted at the base, the distal portion sub-conical, sometimes slightly bent to one side, the apex narrow, truncate, symmetrical, the surface marked by two series of ridges extending around the perithecium, each series composed of four distinct and prominent ridges placed somewhat irregularly and indicating the lines of separation between the middle and the upper and lower series of cells which form the walls of the main body of the perithecium; basal cells of the perithecium small, four in number, not distinguished from it, but somewhat abruptly distinguished from the distal stalk-cell, which is long, sub-cylindrical, sometimes inflated and curved; the basal stalk-cell usually shorter and smaller, bearing distally a single slender, simple, rather closely septate, tapering appendage, usually about as long as the distal stalk-cell. The appendages, which together with the single stalked perithecium spring in groups of three or four from the distal ends of large cylindrical cells projecting from the sucker-like receptacle (more rarely arising from the latter directly), are simple or once branched, either sterile or producing the solitary antheridia on short branches near their extremities. Spores very minute, acicular, septate near the middle, 12 × 3 μ. Asci sub-cylindrical, 40–45 × 7.5 μ, eight-spored, the spores sub-distichous. Perithecia, 225–290 × 55–75 μ, the stalk-cells (longest), 425 μ, average, 375–25 μ. Appendages, 175–375 μ long. Breadth of sucker-like receptacle, 75 μ.

On *Sunius prolixus* Er., Waverly, Mass.

This form, which is among the most remarkable in the whole group, inhabits only the softer chitinous membranes of its host, beneath the elytra and at the bases of the legs or between the segments, which it perforates by the intrusion of its sucker-like base. From its large size it is readily seen, and when growing from the base of its host's legs projects upward, sometimes on both sides of the thorax, so that the whole or part of the perithecium rises free into the air. It appears to be decidedly rare, yet it will doubtless be found sufficiently abundant in localities where its host is more common than it has been found to be by the writer. It varies considerably as to the number of perithecia which it produces as well as the size and number of cells in its intruded base.

ZODIOMYCES Thaxter. Plate XXIII. II. p. 444

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 263.

Receptacle attached by a single basal cell, above which it is parenchymatously multicellular, expanding distally; its extremity cup-shaped with a distinct rim, from the inner surface of which arise numerous sterile appendages, surrounding numerous stalked appendiculate perithecia and antheridial branches originating from the central parenchyma. Antherozoids exogenous, rod-like, terminal or short fertile appendages. Spores once-septate near their base.

The present genus is without doubt the most remarkable of the many remarkable members of the family, and presents a degree of vegetative development scarcely to have been looked for in the group, while the origin of its perithecia is quite unique. Starting with the slender spore, the basal segment of which is far shorter than the terminal, the young plant begins its development by the formation of numerous transverse partitions in both segments (fig. 1). The distal cells give off a variable number of simple branches, and in the mean time longitudinal divisions appear here and there (fig. 2), which become rapidly more numerous (fig. 3) until the main body is for the most part divided into small, very numerous, squarish cells (fig. 4). The main body of the fungus then assumes a more or less clavate form, and is terminated by what may be called the *primary appendage*, the basal cells of which may have a few longitudinal septa (fig. 5), the distal ones producing long, slender branches. A more rapid growth peripherally of the portion below the base of this primary appendage causes the wall-cells in this region to arch outward, producing a more or less distinct cavity, completely enclosed within, as is indicated in fig. 5. As this cavity enlarges, secondary appendages begin to grow inward and upward from the inner surfaces of the cells forming its lateral walls; while from the cells forming its floor the perithecia arise. As a result the secondary appendages break through at the base of the primary appendage, which is turned to one side and soon disappears. This condition is shown in fig. 6, in which the terminal cavity is indicated partly as if seen in section, the secondary appendages having burst out above it and turned the primary appendage to one side, its base being represented at the left. The cavity goes on enlarging till the perithecia begin to be protruded within the circle of secondary appendages (fig. 7); while by further general growth the mature condition is finally reached, as represented in fig. 8. A longitudinal section through the fertile portion of an adult individual then presents the condition shown in fig. 9, which is drawn from a microtome section kindly made for me by Dr. Richards, but is to some extent diagrammatic. Half only of the cup-like extremity is represented, the rim at the right showing the sterile secondary appendages arising from its inner face. The flattened bottom of the cup is seen to consist of crowded parenchyma cells, from which arise directly the perithecia in various stages of development, and the small and inconspicuous antheridial appendages. The latter consist of a few, usually three, superposed, rather short cells, bearing at the tips (figs. 21–23) one to three (usually two) rather large, rod-like bodies, which must be considered exogenous antherozoids, and suggest in a way the spermatia of some lichens. These appear to be formed successively, as in the case of Ceratomyces; but owing to the comparatively small size of the antheridia and the difficulty of observing them in crushed specimens, this point could not be definitely ascertained. The antherozoids themselves evidently fall off; since they may frequently be found lying loose about the bases of the perithecial stalks, and in this position they seem to be sought out by the trichogynes, which at first invariably grow downward (figs. 9 and 16).

The development of the perithecium is illustrated by figs. 10 to 20 and fig. 25. They arise primarily as an outgrowth or upgrowth from one of the superficial cells forming the bottom of the cup. This protrusion elongates and becomes divided by two septa into three superposed cells (fig. 13). Of these cells the upper, as far as can be determined, follows a development similar to that by which the perithecium is usually formed in members of the group dividing into two primordial cells (fig. 14), the lower of which forms the perithecium proper, the latter the procarpe. The trichogyne is always simple and terminal, consisting of a filament of variable length, which, as has just been mentioned, grows downward (fig. 16) towards the base of the stalk. The great variability in the length of the trichogyne is a further indication that it seeks the antherozoids, continuing to elongate until one of the latter becomes fixed to it, after which it is drawn up into a more or less horizontal position through a curvature at its base (fig. 17). In all of the many observed cases, the antherozoid has been found attached to the tip of the trichogyne, a further confirmation of the view just expressed (figs. 17, 18). After the adherence of the antherozoid the trichogyne soon shrivels, remaining for a time as a slight terminal prominence (fig. 25). Meantime one of the cells at the base of the perithecium, perhaps corresponding to the secondary stalk-cell of other instances, produces a curious short, blunt, upturned outgrowth (fig. 19) without visible significance. The four cell-rows of the perithecial wall then become more or less apparent; but the exact number of cells in each is determined with considerable difficulty. Six cells may, however, in favorable specimens be made out, and in the single type species the third cell from the tip of each row produces an appendage. These appendages (figs. 10–12, etc.) are so placed that those arising from the dorsal cell-rows are higher than the others, and arise side by side; while those from the lateral cell-rows spring from opposite sides of the perithecium. They begin to develop by budding outward after the perithecium is nearly mature (fig. 20) and have no special significance, their purpose being probably protective. The terminal cells of the perithecium end each in a short, sharp, slender projection (figs. 9–11). The ascogenic cell appears to be solitary, but this point has not been made out definitely. At maturity the septa of the basal cells of the perithecia are apparently obliterated, as are the cavities of the wall-cells. The main body or receptacle of the mature individual is attached by a single large, slightly colored cell, above which it may produce more or less solid cellular outgrowths, simple, lobed, or even branched, and arising from one or both sides. These outgrowths, which are doubtless designed to prevent sudden lateral bending, are very often wholly wanting even in old individuals. The medullary portion of the receptacle, which lies below the peritheciigerous area, is made up of cells charged with dense yellowish fatty protoplasm.

Zodiomyces vorticellarius Thaxter. Plate XXIII, figs. 1–24.

Proc. Am. Acad. Arts and Sci. Vol. XXIV, p. 263 ; Saccardo Sylloge, Vol. IX, p. 1130.

Hyaline or livid with a central yellowish tinge, often suffused basally with dull purplish above and including the sometimes nearly opaque basal cell. Perithecia numerous, variable in number, each terminal on a slender cylindrical stalk of two superposed cells, becoming sub-lateral through the production of a short lateral upturned blunt outgrowth, arising from a short cell cut off below its base; its apex more or less pointed, curved strongly forward from the base of a pair of blunt rather stout sub-cylindrical or sub-clavate recurved appendages, which arise side by side from its posterior surface ; producing laterally on each side, lower than the first, a second appendage, long, slender, curved outward and backward, tapering to a more or less attenuated tip: the body of the perithecium slightly inflated, stouter distally, narrowed towards its base, its basal cells (three?) small and ill defined. Receptacle very variable in size and form, expanding distally to the cup-like extremity from within the margin of which arise numerous crowded, cylindrical, septate, simple or sparingly branched sterile appendages which surround and greatly exceed in length the mass of perithecia; below more or less attenuated, often producing near the base cellular outgrowths on one or both sides, which vary in form and size. Spores, 45 × 2.5–3 μ. Perithecia, 55 × 15 μ, dorsal appendages, 15–30 × 5 μ, lateral appendages longer, 50 × 3 μ, pedicel, 35–50 × 3.5–4 μ. Sterile appendages longer, 200–220 × 3–4 μ. General receptacle, 220–900 μ; width at distal end 90–180 μ; the basal outgrowths, longest, 365 μ.

On *Hydrocombus lacustris* Lec. and *H. fimbriatus* Melsh. Near New Haven, Connecticut; York, Maine. On an undetermined Hydrocombus (?) from Slaughter, Washington (Miss Parker).

This species presents very great variations in size and form, being elongate with a slender base or short and stout; and, though usually nearly symmetrical at maturity, is sometimes very considerably bent or distorted; such differences depending doubtless largely upon the position in which it grows. The basal cushion-like outgrowths, when present, are also very variable in form and size, and are not infrequently once branched. In most instances their cells are arranged with a certain degree of definiteness (fig. 8), but are not infrequently irregularly massed. In its younger conditions, for some time after the perithecia and appendages have broken out, the plant may have a one-sided appearance until the original terminal portion (primary appendage) has sloughed off; after which the cup-shaped extremity becomes usually quite symmetrical. The antheridia are recognized with considerable difficulty, owing to their small size, and do not appear to be very numerous; but young perithecia with trichogynes are always sufficiently abundant.

The species was first found on hosts collected in a brook fed by a pond in West Haven, Conn.; but not in any abundance. More recently sufficient material has been obtained from the brook immediately below Chase's Pond at York, Me., while several specimens were found on an undetermined host, kindly collected for me in Washington by Miss Parker. It is therefore doubtless widely distributed in this country, though perhaps never very common. The hosts are most readily obtained in gravel just at the margins of cool brooks, or in leaves and other rubbish caught on partly submerged rocks or sticks in similar situations, and the parasite, owing to its large size and pale color, is very readily seen, attached to the legs and in various positions on the lower surface of the thorax and abdomen.

CERATOMYCES[1] Thaxter. Plates XXIV–XXV.

II. p. 435

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 34.

Receptacle consisting of a variable number of superposed cells bearing terminally the perithecium and appendage. Perithecium consisting of four rows of wall-cells, each containing numerous cells, always more than six, often several times this number (seven to sixty-five), the apex various, often with a sub-terminal appendage. Appendage stout, tapering to a branched extremity; consisting of a single series of superposed cells, from the upper inner angle of which may arise branches more or less copious and well developed. Asci clavate, four-spored. Spores acicular, once-septate. Antherozoids long, rod-shaped, exogenous.

The accumulation of numerous species in this genus has rendered its precise description a matter of some difficulty; since, although its characters are well marked, the different species are remarkably variable. The horn-like appendage, which characterizes the perithecia of the species first described, does not prove of generic value, since it is absent in four forms. The only genus which might possibly be mistaken for it, however, is Sphaleromyces; but the presence in this case of flask-shaped antheridia on the branches of the appendage, not to mention its well-developed perithecial stalk-cell, distinguish it without difficulty. Its greatest peculiarity lies in the character and development of the perithecium, which differs from the more typical forms in important points; and although I have been unable to obtain young material which illustrates all the early stages, it appears in *C. mirabilis* to be as follows: The young individual consists of a simple series of superposed cells, the distal of which begin to branch at an early stage; and the first indication of the formation of the perithecium consists in the division by a transverse septum of one of the cells of this series. Of the two cells resulting from this division, the upper grows outward and upward, its outgrowth becoming a finger-like projection (Plate XXIV, fig. 4, at the left) that later elongates to form the filamentous trichogyne. This outgrowth, in the stage represented by the figure, has become divided by two transverse partitions into three cells; the upper being the young trichogyne, the cell below it the trichophoric cell; while below this, not projecting from the axis of the plant, is the smaller carpogenic cell. At the right of the carpogenic cell a vertical septum has divided the remainder of the original upper cell into two parts, an outer and an axile cell; but in other species, like *C. contortus* (Plate XXV, fig. 9), this division seems to be absent. The lower of the two original cells has, in the mean time, been divided by a vertical septum into two cells, one of which (Plate XXIV, fig. 4, x) has also begun to grow outward and upward. As far as can be determined, this cell (x) by further growth and division produces only one of the series of wall- and canal-cells; while the cell previously referred to as the axile cell, lying behind the carpogenic cell, gives rise to the three other series. Having been unable to separate the cells in this region and ascertain their protoplasmic connections with the cells of the perithecium, it is uncertain whether the above statement is entirely correct in so far as concerns the number of wall-cells originating from each of the cells mentioned; but that they give rise to the outer and inner series of perithecial cells cannot be doubted. The latter grow up around and beyond the carpogenic and trichophoric cells, and by the successive division of their terminal members form the main bulk of the perithecium. The base of the trichogyne is thus left behind, as it were, in the angle between the perithecium and the appendage (Plate XXIV, fig. 5, and Plate XXV, fig. 17), where it often persists for some time. While in other genera, as a rule, only one or two divisions of the perithecial cells takes place above the insertion of the trichogyne, in the present instance the growth beyond it may be almost indefinite; as in *C. rostratus*, for example, or *C. filiformis*, in each of which (Plate XXIV, fig. 15 and 18) the perithecium is extraordinarily developed. Although the general process by which the perithecium originates is thus very similar to that which has been described as characteristic of Stigmatomyces or Laboulbenia, it will be observed that its basal cells are differently arranged, and originate in a different manner. Whether it is possible to homologize the typical stalk-cell and secondary stalk-cell with any of those present in this case I do not feel able to determine. The perithecial cells of the inner series differ from those of other genera from the fact that they seem to divide quite independently of, and less frequently than, the wall-cells; as may be seen in fig. 8, Plate XXIV, the septa of the wall-cells ($w\ c$) and of the canal-cell ($c\ c$) in this instance being by no means coincident. As in other cases, the canal-cells are entirely destroyed by the pressure of the spore mass, and there are indications that they are absorbed even before this pressure is exerted.

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[1] This name occurs in Streinz, Nomenclator Fungorum, where reference is made to "Ceratomyces candidus Sturm." An examination of the citation, however, shows this name to be a misprint for *Crateromyces candidus*.

The procarpe, as we have seen, is identical with that of other genera, and the further development of the carpogenic cell, although it has not been traced out in detail, seems to correspond in all respects to that which has been previously described. In species in which it has been possible to determine the number of ascogenic cells with definiteness, four have been seen in every case; but a certain irregularity in the position of the asci in relation to them is often observable, the ordinary biseriate arrangement being at least obscured.

The young individuals of species of this genus bear a close resemblance to those of Zodiomyces, and the slender acicular spores, as in the last named genus, are septate nearer to the base than to the apex except in *C. terrestris.* A further peculiarity of the spores is observable in *C. furcatus* and *C. contortus,* in both of which the septum that divides the spore involves its gelatinous envelope also, which is prominently constricted in this region (Plate XXV, figs. 4 and 10).

The trichogyne is always filamentous, usually not very long, and simple or sparingly branched. The antherozoids are clearly differentiated only in *C. rostratus* (Plate XXIV, figs. 21 and 24) and *C. terrestris* (Plate XXV, fig. 23), in both of which they are long, rod-shaped bodies that fall from their attachment soon after they are formed. In other species they appear to result from the segmentation of slender branches into rod-like pieces like those of the two forms mentioned. It is difficult to obtain trichogynes in a receptive condition, and in only a single instance have I found one to which three or four of the long antherozoids were firmly attached.

The species are in a way divisible into sub-groups corresponding to the genera of the hosts which they inhabit. The three species on Berosus as well as the four on Tropisternus have a distinct family resemblance in either case; while *C. rostratus* is almost sufficiently distinct to be placed in a genus by itself; its chief peculiarity being connected with the production of adventitious branches from about the base of the appendage and perithecium, and the definite and successive production of its antherozoids. It may be mentioned that it is approached in both these respects by the singular little terrestrial form *C. terrestris.* What the near affinities of this peculiar and comparatively imperfectly known genus are, it is difficult to say, although its exogenous antherozoids and the form of its young conditions indicate a nearer relationship with Zodiomyces than with any other known forms.

The species all inhabit aquatic beetles of a single family (Hydrophilidæ), with the exception of *C. terrestris*, which is found on a staphylinid that lives in very wet situations.

CERATOMYCES MIRABILIS Thaxter. Plate XXIV, figs. 1–10.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 34; l. c. Vol. XXX, p. 480.

At first pale, becoming more or less deeply suffused with amber-brown. Perithecium straight externally, more or less inflated internally, the cell-rows composed of from twenty to thirty cells, the anterior row ending below the apex in an appendage often equalling the perithecium in length and tapering to a blunt point, or when broken sometimes producing a few slender terminal branches, becoming blackened and inflated near its base, composed of from ten to sixteen superposed cells. The posterior row terminates opposite the base of this appendage in a bilobed prominence beyond which the short more or less pointed apex is often strongly bent to or towards the base of the perithecial appendage. Antheridial appendage short and stout, usually less than one third as long as the perithecium, sub-conical, with numerous branches produced from its inner side, slender, rather rigid, with more or less divergent branchlets. Receptacle consisting of three superposed cells, followed by two cells; the posterior larger and followed by the basal cells of the appendage; the anterior much smaller, followed by a second cell about equalling it in size, beyond which follows the base of the perithecium: the basal cell wholly or partly hyaline or translucent above the large jet black foot; the remaining cells deeply blackened except along their anterior edges, the blackening involving the base of the antheridial appendage. Spores, 110–120 × 4 μ. Perithecia, 280–300 × 65–70 μ, longest, 330 μ, its appendage, 180–200 μ. Total length to tip of perithecium, 400–525 μ. Antheridial appendage (exclusive of its branches) about one third as long as the perithecium.

On *Tropisternus glaber* Hb. and *T. nimbatus* Say, Milford, Connecticut; Arlington, Mass.; Kittery Point, Maine.

This species, though perhaps the commonest member of the genus, seems never very abundant. It is subject to a good deal of variation in size, but is otherwise very constant in its characters and easily distinguished from the rarer *C. confusus*. It is found on the lower surface of the abdomen and thorax of its host, especially along the margin of the former on the left side, and is conspicuous from its large size.

It may be mentioned that this species, and probably the succeeding, is subject to the external parisitism of a Chytridiaceous parasite of singular structure resembling the Obelidium of Nowakowski in some respects, but apparently belonging to an undescribed genus. The development of this plant has not, however, been as yet fully made out.

CERATOMYCES CONFUSUS Thaxter. Plate XXIV, figs. 11, 12.

Proc. Am. Acad. Arts and Sci. Vol. XXX, p. 480.

General habit and color as in *C. mirabilis*. Perithecium hardly inflated, its inner margin curving evenly to the prominent blunt apex which stands out free from the base of the perithecial appendage. The perithecial appendage shorter and usually stouter than in *C. mirabilis*, without the bulbous inflation at its base. Axis of antheridial appendage long and slender, distally attenuated, with comparatively few short branches. Receptacle as in *C. mirabilis*. Spores, 75–90 × 3.7 μ. Perithecia, 235–335 × 65 μ. Axis of antheridial appendage 235 μ (longest). Receptacle, 165 × 75 μ.

On *Tropisternus glaber* Hb. and *T. nimbatus* Say, Milford, Connecticut, and Kittery Point, Maine.

This species is much rarer than *C. mirabilis*, and is at once distinguished by the absence of any posterior prominences below the apex of the perithecium, as well as by the differences presented by its perithecial and antheridial appendages. Its spores also seem constantly smaller, and although the two species are so strikingly similar, it is unlikely that they are mere varieties of a single form. It occurs, like the preceding species, along the inferior margin of its host's body, but almost always on the opposite (right) side.

CERATOMYCES CAMPTOSPORUS Thaxter. Plate XXIV, figs. 13, 14.

Proc. Am. Acad. Arts and Sci. Vol. XXVII, p. 35.

Pale amber-brown. Perithecium strongly curved near the base, rather stout, its cell-rows made up of from thirty-five to forty members which, on the anterior row, are somewhat inflated and constricted at the septa, giving a strongly corrugated outline on this side, the inner margin bent abruptly almost at right angles to the blunt tip, below which, externally, a nearly straight erect perithecial appendage arises, composed of six or more superposed cells, sometimes bearing terminal branchlets. Antheridial appendage consisting of a short curved basal cell, above which it is abruptly expanded, tapering thence to a rather slender tip; the antheridial branchlets terminal, few in number (or wholly broken off). Receptacle very small, consisting of a few superposed cells for the most part black and opaque. Spores slightly swollen, and bent near the apex, long and slender, 110 × 3.5 μ. Perithecia, 275 × 85–90 μ. Receptacle, 90 × 50 μ.

On *Tropisternus glaber* Hb., Milford, Connecticut; Arlington, Mass. On *T. striolatus* Lec., Texas.

This species appears to be very rare, and I have collected it but once since the three types were found at Milford. A specimen on the above-mentioned host from Texas seems to correspond in all essentials, though not in very good condition, and is more rigid in form without the sub-sigmoid habit of the other specimens. The type-form is at once distinguished by the character of its antheridial appendage, the form of its perithecium, and especially by its greatly reduced and almost wholly blackened receptacle and the characteristic irregularity of its spores. It is found along the lower margin of its host, but was attached to the edge of the elytron in the only specimen in which its exact position was noted.

CERATOMYCES FILIFORMIS Thaxter. Plate XXIV, figs. 15–17.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 187.

Suffused with dark amber-brown. Receptacle consisting of three superposed cells, the basal one partly blackened, surmounted by two cells which form the origin of the perithecium and antheridial appendage. Perithecium very long and slender, hardly inflated, tapering abruptly and symmetrically to the subtruncate apex, the cell-rows composed of very numerous cells (maximum forty-five). Appendage short, tapering, straight, bearing terminally or sub-terminally one or two slender branches. Spores, 55–60 × 3 μ. Perithecia, 250–330 × 33–40 μ. Receptacle, 35 × 85 μ. Appendage, 90 μ.

On the edge of the elytra of *Tropisternus glaber* (Hb.) and *T. nimbatus* Say, Milford, Connecticut; Arlington, Mass., and Kittery Point, Maine.

This species was at first taken for an abnormal form, but sufficient material shows that it is a well-marked species. It occurs near the tip of the elytron on the upper surface, and is with difficulty distinguished from the bristle-like hairs among which it occurs. It is remarkable for the very small number of spores present in the perithecium, which is more commonly almost empty, especially in specimens in which there are the greatest number of wall-cells. It is never found in abundance and seems decidedly rare.

CERATOMYCES MINISCULUS Thaxter. Plate XXV, figs. 15–18.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 187.

Becoming more or less deeply tinged with amber-brown. Receptacle consisting of about three superposed basal cells, all blackened, opaque, and indistinguishable, surmounted by a few small cells partly blackened below, from which arise the appendage and perithecium. Perithecium sub-conical, ten or eleven cells in each cell-row, a short blunt conical unicellular projection borne sub-laterally below the tip, which is usually curved slightly outward. Appendage tapering to a slender tip, simple, or bearing a few short branches near its apex, seldom as long as the perithecium. Spores, 75 × 4 μ. Perithecia, 110–150 × 30–40 μ. Receptacle, average, 90 × 40 μ. Appendage, 50–110 μ long.

On *Tropisternus nimbatus* Say, Kittery Point, Maine; Milford, Connecticut; Texas.

This curious little species occurs rather rarely, growing appressed on the lower surface of the hyaline outer margin of the right elytron of its host, usually near the tip, and is readily distinguished by its relatively large jet-black receptacle, which is about as large as the perithecium itself. It is not readily obtained in good condition.

CERATOMYCES TERRESTRIS Thaxter. Plate XXV, figs. 19–24.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 94.

Nearly hyaline, with black or dark brown suffusions. Perithecium large, slightly inflated, tapering to a bluntly rounded or truncate apex, from which the sharply pointed lips project; the wall of the perithecium consisting of four series of about twelve cells each, its base formed from three small cells, below which a single similar small cell connects it with the receptacle. Receptacle consisting of three small superposed squarish cells, the upper of which gives rise to the perithecium and the appendage. The appendage, consisting of six or more superposed, flattened cells becoming externally suffused with blackish brown or black (the suffusion sometimes involving the whole series as well as the entire receptacle, with the exception of its basal cell), bearing on its inner side numerous hyaline branches simple or once or twice branched, the lower arising from a series of small cells which may extend across the base of the perithecium on one side. Spores, 15 × 2.5–3 μ. Perithecium, 75–90 × 22–29 μ. Receptacle, 25 μ long. Total length to tip of perithecium, 100–140 μ, to tip of main appendage, 45–65 μ. Longest branches of appendage, 75 μ.

On *Lathrobium punctulatum* Lec., Kittery Point, Maine; Arlington, Mass.

This minute and curious species is chiefly interesting from the fact that it is a terrestial form in a typically aquatic genus, of which, however, it seems to possess all the essential characters. In contrast to its congeners, it is among the smallest of all the Laboulbeniaceæ, and is very readily overlooked. It inhabits the legs of its host as a rule, but is sometimes found on the abdomen. It varies considerably in the number of branches which arise from the appendage or from cells near its base, and some of these branches are peculiar, for what appears to be a gelatinous modification of their tips, which result in the clavate form shown in figs. 20–21. In the majority of specimens the branches are wholly broken off, as in figs. 19 and 22. Unlike the other species of the genus, the spores appear to be septate near the apex.

CERATOMYCES ROSTRATUS Thaxter. Plate XXIV, figs. 18–27.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 188.

Reddish or amber-brown. Receptacle long, slender, expanding slightly upward, consisting of about twelve superposed cells. Perithecium consisting of a clearly distinguished neck and an inflated oval basal portion, completely filled with spores and asci, which pushes the appendage to one side and continues directly the axis of the receptacle; the neck very elongate, irregularly cylindrical, straight or its terminal portion at maturity (in perfectly developed specimens) abruptly bent upon itself, the recurved portion tapering slightly to the hunched asymmetrical apex; the cell-rows made up of seventy cells, more or less. Appendage arising from a broad base flattened at maturity by pressure from the base of the perithecium, consisting of about six superposed cells bearing numerous branches, which may in turn be several times branched. Spores about 75 × 3.5 μ. Perithecia, basal portion, 110–150 × 65–90 μ; neck, including recurved portion, longest, 1.17 mm. Appendage about 90–100 μ long, its longest branches about 200 μ. Receptacle, large, about 260 μ long by 55 μ at the distal end.

On *Hydrocombus fimbriatus* Melsh., Massachusetts, Texas; *Philhydrus cinctus* Say, Maine. A variety on *P. nebulosus* Say, Maine.

The most remarkable species of the genus, the enormously elongated neck of the perithecium becoming hooked only in fully mature specimens, and serving an evident purpose in the spore dissemination during coitus.

In perhaps a majority of specimens the neck is shorter and straight, and there are very considerable variations in size and form. The appendage is often very broad at its base, and projects outward, often at a considerable angle; while its basal cells may be irregularly divided and produce branches which, in some cases, even seem to arise from the lower perithecial wall-cells, forming a rather dense tuft, while in other cases they are more sparingly developed. The number of cells composing the receptacle is subject to considerable variation; and the cell-rows of the perithecium present very great differences in the number of their component cells. Unlike any other species, there is a distinct differentiation between the terminal conductive portion of the perithecium and its inflated ascigerous base, which is, apparently through pressure of its contents, hardly distinguished in many cases from the base of the appendage. The antheridial branches and the antherozoids of this species, which are peculiar in many respects, have been already alluded to (p. 210). The typical form is probably widely distributed, and is not uncommon in the brook below the cascade at Waverly and in some other localities about Boston. A few specimens were also obtained from a Texan specimen of *Hydrocombus* in the Museum collection, and it occurs rarely on *Philhydrus cinctus* at Kittery Point, Maine. A small variety which should not, I think, be separated specifically from the present form, occurs on the lower surface of the elytra of *P. nebulosus* Say, near the tip or the outer margin, and is represented in figs. 26, 27. Although so very much smaller, and apparently always confined to the situation mentioned, it possesses no essential differences by which it can be distinguished from many forms of the present species, which is found on the inferior surface of the abdomen and thorax of its host and not unfrequently on the legs. It is subject to the attack of a chytridiaceous parasite similar to that which occurs on *C. mirabilis*, but specifically distinct.

CERATOMYCES FURCATUS Thaxter. Plate XXV, figs. 1–4.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 186.

Hyaline, becoming more or less suffused with reddish brown, the appendages sometimes purplish. Receptacle composed of three or four superposed cells, surmounted by two cells, from which arise the perithecium and appendage. Perithecium large and stout, externally nearly straight, inwardly inflated and strongly curved to the pointed apex, below which arises externally and sub-laterally a large, stout, flexed appendage, tapering and bearing toward its tip a single row of short branches, which may be in turn once branched. Cell-rows of perithecium each consisting of about eight cells. Antheridial appendage very large, consisting of twenty cells (more or less) bearing branches at irregular intervals from its inner surface. Spores, 85–90 × 4 μ. Perithecia, 130–150 × 45–60 μ. Receptacle, 90–110 × 45–55 μ. Antheridial appendage, 300–425 μ. Perithecial appendage about 325 μ.

On *Berosus striatus* Say, Maine.

This singular-looking species occurs, so far as I have observed, only on the right side of the lower surface of the thorax in small groups. Its very large antheridial appendages distinguish it from other species, and give it the Y or V form which has suggested the specific name. The spores, like those of *C. contortus*, are peculiar in that the septum involves also the gelatinous envelope. It seems to be a decidedly rare form, and with *C. humilis* and the last mentioned species, all occurring on the same host, has been thus far found only at Kittery Point, Maine, in a small pond near the highest point of Cutts Island.

CERATOMYCES CONTORTUS Thaxter. Plate XXV, figs. 5–10.

Proc. Am. Acad. Arts and Sci. Vol. XXVIII, p. 186.

Hyaline, becoming very faintly brownish. Receptacle consisting of three superposed cells, above which three cells form the general base of the perithecium and appendage. Perithecium long and slender, usually constricted at the base so as to appear short stalked, slightly inflated and bent outward, the apex pointed and curved. A short appendage arises sub-laterally below the apex and is strongly curved, extending inward beyond the apex, its fifth and sometimes also its sixth cell producing from its upper surface a stout branch which may be simple or may bear secondary branches at irregular intervals. Antheridial appendage consisting of about twelve superposed cells, producing a few branches from its inner side at irregular intervals, the branches in turn more or less irregularly branched. Spores, 80–85 × 3–3.5 μ. Perithecia, 200–260 × 35–45 μ. Receptacle about 125 μ long. Antheridial appendage, 110–130 μ. Perithecial appendage, 75 μ long.

On *Berosus striatus* Say, Kittery Point, Maine.

This species is somewhat more frequently met with than the preceding, and is usually found on the lower surface of the abdomen on the left side near its tip. It is readily distinguished from *C. furcatus* by its more slender habit, almost stalked perithecium, much smaller appendages and generally malformed and distorted habit. It has as yet been found only in the locality mentioned under the preceding species, to which it is most nearly allied. As already stated, its spores are peculiar for the constriction about their septum, which involves the gelatinous envelope.

CERATOMYCES HUMILIS Thaxter. Plate XXV, figs. 11–14.

Proc. Am. Acad. Arts and Sci. Vol. XXIX, p. 94.

Hyaline, becoming faintly tinged with brownish. Perithecium rather narrow, without any appendage, the apex blunt or nearly truncate, its cell-rows composed of not more than seven cells. Receptacle composed of from two to five superposed squarish cells. Appendage consisting of six to twelve superposed cells, the series tapering distally and producing irregularly from its inner face branches which may in turn be several times branched and may reach a length twice that of the perithecium. Spores, 22 × 3 μ. Perithecia, 100 × 25 μ. Total length to tip of perithecium, 150–185 μ. Longest branches of appendage, 180 μ.

On *Berosus striatus* Say, Kittery Point, Maine.

A somewhat insignificant species allied to *C. contortus*, from which it is easily distinguished by its small size and by the absence of any appendage near the tip of the perithecium. It occurs more frequently between the terminal claws of the middle pair of legs, but is rarely found on the elytra. In two specimens the perithecia have become distinctly tinged with brown, but as a rule the whole plant is hyaline.

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INDEX OF HOST INSECTS.

COLEOPTERA.

CARABIDÆ.

Name of Host Insect.	Name of Parasite.
Acrogenys hirsuta Maclean,	Laboulbenia australiensis Thaxter.
Acupalpus carus Lec.,	Rhachomyces lasiophorus Thaxter.
Agonoderus pallipes Fabr.,	Laboulbenia polyphaga Thaxter.
Amara sp. indet.,	" " "
Anisodactylus baltimorensis Say,	" compressa Thaxter.
" " "	" elongata Thaxter.
" " "	" macrotheca Thaxter.
" **Harrisii** Lec.,	" filifera Thaxter.
" **interpunctatus** Kirby,	" " "
" **nigerrimus** Dej.,	" " "
" " "	" lepida Thaxter.
" " "	" Pterostichi Thaxter.
" spp. indet.,	" filifera Thaxter.
" " "	" macrotheca Thaxter.
Anomoglossus pusillus Say,	" variabilis Thaxter.
Anophthalmus Bilimeki Sturm.,	Rhachomyces hypogæus Thaxter.
" **Menetriesii** Motsch.,	Laboulbenia subterranea Thaxter.
" **Motschulskyi** Schm.,	" " "
" **pusio** Horn,	Rhachomyces speluncalis Thaxter.
" **tenuis** Horn,	Laboulbenia sp. indet.
Aptinus mutilatus Fabr.,	" europæa Thaxter.
Aspidoglossa subangulata Chaud.,	" Aspidoglossæ Thaxter.
Atranus pubescens Dej.,	Rhachomyces lasiophorus Thaxter.
" " "	Eucantharomyces Atrani Thaxter.
Badister maculatus Lec.,	Laboulbenia polyphaga Thaxter.
" **micans** Lec.,	Rhachomyces lasiophorus Thaxter.
Bembidium Andreæ F.,	Laboulbenia vulgaris Peyritsch.
" **bimaculatum** Kirby,	" curtipes Thaxter.
" **bipunctatum** Duft.,	" vulgaris Peyritsch.
" " "	" luxurians Peyritsch.
" **complanulum** Mann.,	" cornuta Thaxter.
" **decorum** Pz.,	" vulgaris Peyritsch.
" **fasciolatum** Duft.,	" " "
" **femoratum** Sturm.,	" " "
" **flammulatum** Clairv.,	" " "
" " "	" luxurians Peyritsch.
" **lævigatum** Say,	" vulgaris Peyritsch.
" **littorale** Pz.,	" " "
" **lunatum** Duft.,	" " "
" " "	" flagellata Peyritsch.

Name of Host Insect.	Name of Parasite.
Bembidium mexicanum Dej.,	Laboulbenia vulgaris Peyritsch.
" **obsoletum** Dej.,	" " "
" **punctulatum** Drap.,	" " "
" **varium** Oliv.,	" luxurians Peyritsch.
Blethisa multipunctata Fabr.,	" variabilis Thaxter.
" **quadricollis** Bald.,	" " "
Brachinus crepitans L.,	" Rougetii Mont. and Robin.
" **explodens** Duft.,	" " " " "
" " "	" europæa Thaxter.
" **mexicanus** Dej.,	" Brachini Thaxter.
" **scolopeta** Fabr.,	" Rougetii Mont. and Robin.
" spp. indet.,	" Brachini Thaxter.
" "	" texana Thaxter.
Bradycellus rupestris Say,	" inflata Thaxter.
Callida pallidipennis Chaud.,	" minima Thaxter.
Callistus lunatus Fabr.,	" europæa Thaxter.
Casnonia pennsylvanica Linn.,	" Casnoniæ Thaxter.
Catascopus guatemalensis Bates,	" Catascopi Thaxter.
" spp. indet.,	" " "
Chlænius æneocephalus Dej.,	" europæa Thaxter.
" **æstivus** Say,	" variabilis Thaxter.
" **chrysocephalus** Rossi,	" europæa Thaxter.
" **cumatilis** Lec ,	" variabilis Thaxter.
" **cursor** Chev.,	" " "
" **floridanus** Horn,	" " "
" **leucoscelis** Chaud.,	" " "
" **pennsylvanicus** Say,	" " "
" **ruficauda** Chaud.,	" " "
" **sparsus** Lec.,	" " "
" **tenuicollis** Fabr.,	" proliferans Thaxter.
" **texanus** Horn,	" variabilis Thaxter.
" **tricolor** Dej.,	" " "
" **velutinus** Duft.,	" proliferans Thaxter.
" **vestitus** F.,	" fasciculata Peyritsch.
" **viridicollis** Reiche,	" variabilis Thaxter.
" spp. indet.,	" " "
Clivina cordata Pz.,	" Schizogenii Thaxter.
" **dentifemorata** Pz.,	" Clivinæ Thaxter.
" **dentipes** Dej.,	" " "
Colpodes cæruleomarginatus, Chaud.,	" elongata Thaxter.
" **cyanonotus** Chaud.,	" " "
" **duplex** Bates,	" " "
" **grata** Bates,	" " "
" **evanescens** Bates,	Rhachomyces longissimus Thaxter.
" **incultus** Bates,	Laboulbenia elongata Thaxter.
" **purpuripennis** Chaud.,	" " "
" **sphodroides** Chaud.,	" " "
" **petilus** Bates,	" " "
" **tenuicornis** Chaud.,	" " "
" spp. indet.,	" " "
Coptodera Championi Bates,	" Coptoderæ Thaxter.
Crepidogaster bimaculata Boh.,	" zanzibarina Thaxter.
Dolichus ? sp. indet.,	" proliferans Thaxter.
Eudema tropicum Hope,	" " "

NAME OF HOST INSECT.	NAME OF PARASITE.
Eudema sp. indet.,	Laboulbenia proliferans Thaxter.
Galerita æquinoctialis Chaud.,	" decipiens Thaxter.
" " "	" mexicana Thaxter.
" **atripes** Lec.,	" Galeritæ Thaxter.
" **Janus** Fabr.,	" " "
" **leptodera** Chaud.,	" longicollis Thaxter.
" **mexicana** Dej.,	" Galeritæ Thaxter.
" " "	" melanotheca Thaxter.
" " "	" mexicana Thaxter.
" **nigra** Chev.,	" " "
" sp. indet.,	" decipiens Thaxter.
" "	" longicollis Thaxter.
Harpalus erythropus Dej.,	" filifera Thaxter.
" **pennsylvanicus** DeG.,	" arcuata Thaxter.
" " "	" conferta Thaxter.
" " "	" elegans Thaxter.
" " "	" Harpali Thaxter.
" **pfeuriticus** Kirby	" polyphaga Thaxter.
Læmosthenes cavicola Sch.,	" elongata Thaxter.
Loxandrus spp. indet.,	" polyphaga Thaxter.
Macrochilus biguttatus Goeze,	" elongata Thaxter.
Morio Georgii Pal.,	" Morionis Thaxter.
Mormolyce phyllodes Hagenb.,	" Kunkeli (Giard).
" " "	" palmella Thaxter.
Nebria brunnea Duft.,	" Nebriæ Peyritsch.
" **gregaria** Fisch.,	" " "
" **pallipes** Say,	" " "
" **Sahlbergi** Fisch.,	" " "
" **villæ** Dej.,	" " "
Olisthopus parmatus Say,	" polyphaga Thaxter.
Omophron americanum Dej.,	" variabilis Thaxter.
" **limbatum** F.,	" fasciculata Peyritsch.
" sp. indet.,	" variabilis Thaxter.
Pachyteles luteus Hope,	Dimeromyces africanus Thaxter.
" **mexicanus** Chaud.,	Laboulbenia Pachytelis Thaxter.
Panagæus crucigerus Say,	" Panagæi Thaxter.
" **fasciatus** Say,	" " "
Patrobus longicornis Say,	" brachiata Thaxter.
" " "	" variabilis Thaxter.
" **tenuis** Say,	" brachiata Thaxter.
Pheropsophus æquinoctialis Linn.,	" Pheropsophi Thaxter.
" (?) **marginatus** Dej.,	" " "
" spp. indet.,	" " "
" " "	Enarthromyces indicus Thaxter.
Platynus æruginosus Dej.,	Laboulbenia parvula Thaxter.
" **affinis** Kirby,	" contorta Thaxter.
" **bicolor** Lec.,	" elongata Thaxter.
" **brunneomarginatus** Mann.,	" " "
" **cincticollis** Say,	" " "
" " "	" fumosa Thaxter.
" " "	Peyritschiella curvata Thaxter.
" " "	" minima Thaxter.
" **dissectus** Lec.,	Laboulbenia elongata Thaxter.
" **extensicollis** Say,	" "

Name of Host Insect.	Name of Parasite.
Platynus extensicollis Say,	Laboulbenia contorta Thaxter.
" " "	" gibberosa Thaxter.
" " "	" parvula Thaxter.
" " "	" paupercula Thaxter.
" " "	" recta Thaxter.
" " "	" scelophila Thaxter.
" " "	" variabilis Thaxter.
" **floridanus** Lec.,	" elongata Thaxter.
" **melanarius** Dej.,	" " "
" " "	" paupercula Thaxter.
" **ovipennis** Mann.,	" elongata Thaxter.
" **picticornis** Newm.,	" " "
" **pusillus** Lec.,	" " "
" **ruficornis** Lec.,	" " "
" **sinuatus** Dej.,	" " "
" **viduus** Pz.,	" anceps Peyritsch.
Pristonychus, see **Læmosthenes**.	
Pterostichus adoxus Say,	" variabilis Thaxter.
" **caudicalis** Say,	" " "
" **corvinus** Dej.,	" " "
" **erythropus** Dej.,	Peyritschiella geminata Thaxter.
" **luctuosus** Dej.,	" " "
" " "	Laboulbenia Pterostichi Thaxter.
" " "	" terminalis Thaxter.
" " "	" variabilis Thaxter.
" **mancus** Lec.,	" Pterostichi Thaxter.
" **patruelis** Dej.,	Peyritschiella geminata Thaxter.
" " "	Laboulbenia rigida Thaxter.
" **relictus** Newm.,	" variabilis Thaxter.
" **Sayi** Brullé,	" " "
" vel. affin. (S. Amer.)	" " "
Schizogenius ferrugineus Pz.,	" Schizogenii Thaxter.
" **lineolatus** Say,	" " "
Stenolophus fuliginosus Dej.,	" polyphaga Thaxter.
" **limbalis** Lec.,	" " "
" **ochropezus** Say,	" umbonata Thaxter.
Trechus chalybeus Mann.,	" vulgaris Peyritsch.

HALIPLIDÆ.

Cnemidotus muticus Lec.,	Hydræomyces Halipli Thaxter.
Haliplus ruficollis DeG.,	" " "

DYTISCIDÆ.

Bidessus granarius Aube,	Chitonomyces bidessarius Thaxter.
Desmopachria convexa Aube,	" aurantiacus Thaxter.
" " "	" borealis Thaxter.
Hydroporus spurius Lec.,	" marginatus Thaxter.
" " "	" rhyncostoma Thaxter.
" " "	" simplex Thaxter.
" " "	" uncinatus Thaxter.
Laccophilus hyalinus Dej.,	" paradoxus (Peyritsch).
" " "	" melanurus Peyritsch.
" **minutus** Sturm.,	" " "
" " "	" paradoxus (Peyritsch).

Name of Host Insect.	Name of Parasite.
Laccophilus maculosus Germ.,	Chitonomyces affinis Thaxter.
" " "	" appendiculatus Thaxter.
" " "	" distortus Thaxter.
" " "	" hyalinus Thaxter.
" " "	" lichanophorus Thaxter.
" " "	" marginatus Thaxter.
" " "	" paradoxus (Peyritsch).
" " "	" rhyncostoma Thaxter.
" " "	" simplex Thaxter.
" " "	" spinigerus Thaxter.
" " "	" uncigerus Thaxter.
" " "	" uncinatus Thaxter.
" sp. indet.,	" affinis Thaxter.
" " "	" marginatus Thaxter.
" " "	" paradoxus (Peyritsch).
" " "	" uncigerus Thaxter.
GYRINIDÆ. 4	
Gyretes compressus Lec.,	Laboulbenia Guerinii Mont. and Robin.
" **sericeus** Lab.,	" " " "
Gyrinus affinis Aube,	" Gyrinidarum Thaxter.
" **analis** Say,	" " "
" **confinis** Lec.,	" " "
" **fraternus** Coup.,	" " "
" **plicifer** Lec.,	" " "
" **urinator** Illig.,	" " "
" **ventralis** Kirby,	" " "
Orectogyros heros Reg.,	" Oberthuri Giard.
" **Bedeli** Reg.,	" Orectogyri Thaxter.
HYDROPHILIDÆ. 5	
Berosus striatus Say,	Ceratomyces contortus Thaxter.
" " "	" furcatus Thaxter.
" " "	" humilis Thaxter.
Hydrocombus fimbriatus Melsh.,	" rostratus Thaxter.
" " "	Zodiomyces vorticellarius Thaxter.
" **lacustris** Lec.,	" " "
" sp. indet.,	" " "
Philhydrus cinctus Say,	Ceratomyces rostratus Thaxter.
" **nebulosus** Say,	" " "
Tropisternus glaber Hb.,	" camptosporus Thaxter.
" " "	" confusus Thaxter.
" " "	" filiformis Thaxter.
" " "	" mirabilis Thaxter.
" **nimbatus** Say,	" confusus Thaxter.
" " "	" filiformis Thaxter.
" " "	" minisculus Thaxter.
" " "	" mirabilis Thaxter.
" **striolatus** Lec.,	" camptosporus Thaxter.
STAPHYLINIDÆ. 6	
Actobius nanus Horn,	Teratomyces Actobii Thaxter.
" " "	" brevicaulis Thaxter.
" " "	Diplomyces Actobianus Thaxter.
Acylophorus flavicollis Sachs,	Teratomyces mirificus Thaxter.

Name of Host Insect.	Name of Parasite.
Acylophorus flavipes Lec.,	Teratomyces mirificus Thaxter.
“ **pronus** Er.,	“ “ “
Bledius armatus Er.,	Cantharomyces occidentalis Thaxter.
“ **assimilis** (ms. name ?)	“ Bledii Thaxter.
“ **basalis** Lec.,	“Amorphomyces” floridanus Thaxter.
“ **emarginatus** Say,	Haplomyces virginianus Thaxter.
“ **ornatus** Lec.,	“ californicus Thaxter.
“ **rubiginosus** Er.,	“ texanus Thaxter.
Cryptobium bicolor Grav.,	Corethromyces Cryptobii Thaxter.
“ **pallipes** Grav.,	“ “ “
Deleaster dichrous Grav.,	Idiomyces Peyritschii Thaxter.
Falagria dissecta Er.,	Amorphomyces Falagriæ Thaxter.
“ “ “	Dimorphomyces denticulatus Thaxter.
“ “ “	“ muticus Thaxter.
Lathrobium angulare Lec.,	Rhadinomyces pallidus Thaxter.
“ **collare** Ehr.,	Corethromyces jacobinus Thaxter.
“ **fulvipenne** Grav.,	Rhachomyces pilosellus (Robin).
“ “ “	Rhadinomyces pallidus Thaxter.
“ **jacobinum** Lec.,	Corethromyces jacobinus Thaxter.
“ **longiusculum** Grav.,	Rhachomyces Lathrobii Thaxter.
“ **nitidulum** Lec.,	Corethromyces setigerus Thaxter.
“ “ “	Rhadinomyces cristatus Thaxter.
“ “ “	Sphaleromyces Lathrobii Thaxter.
“ **punctulatum** Lec.,	Ceratomyces terrestris Thaxter.
“ “ “	Rhadinomyces cristatus Thaxter.
“ “ “	“ pallidus Thaxter.
“ “ “	Sphaleromyces Lathrobii Thaxter.
“ **tenue** Lec.,	Corethromyces setigerus Thaxter.
Lathrobium vel affin.,	Rhachomyces arbusculus Thaxter.
Othius fulvipennis Fabr.,	“ furcatus Thaxter.
Pæderus littorarius Grav.,	Laboulbenia cristata Thaxter.
“ **obliteratus** Lec.,	“ “ “
“ **ruficollis** Fabr.,	“ “ “
“ spp. indet.,	“ “ “
Philonthus æqualis Horn,	“ Philonthi Thaxter.
“ **cunctans** Horn,	“ “ “
“ **debilis** Grav.,	Dichomyces furciferus Thaxter.
“ “ “	“ inæqualis Thaxter.
“ “ “	Peyritschiella nigrescens Thaxter.
“ “ “	Laboulbenia Philonthi Thaxter.
“ **furvus** Nord.,	“ “ “
“ **micans** Grav.,	“ “ “
“ **sordidus** Grav.,	Dichomyces princeps Thaxter.
“ spp. indet.,	Laboulbenia Philonthi Thaxter.
Pinophilus densus Lec.,	Sphaleromyces occidentalis Thaxter.
“ **latipes** Ehr.,	Chætomyces Pinophili Thaxter.
Quedius ferox Lec.,	Teratomyces Quedianus Thaxter.
“ **vernix** Lec.,	Laboulbenia Quedii Thaxter.
Sunius longiusculus Mann.,	Camptomyces melanopus Thaxter.
“ “ “	Compsomyces verticillatus Thaxter.
“ **prolixus** Ehr.,	Camptomyces melanopus Thaxter.
“ “ “	Moschomyces insignis Thaxter.
Tachinus pallipes,	gen. indet.
Trogophlæus spp. indet.,	Cantharomyces pusillus Thaxter.
Xantholinus obsidianus Melsh.,	Dichomyces infectus Thaxter.

Name of Host Insect.	Name of Parasite.
COCCINELLIDÆ.	
Chilocorus bivulnerus Muls.,	Stigmatomyces virescens Thaxter.

DIPTERA.

Name of Host Insect.	Name of Parasite.
DIOPSIDÆ.	
Diopsis thoracica Westw.,	Laboulbenia Diopsis Thaxter.
" " "	Rhizomyces ctenophorus Thaxter.
DROSOPHILIDÆ.	
Drosophila nigricornis Loew.,	Stigmatomyces entomophilus (Peck).
" **funebris** L.,	" " "
MUSCIDÆ.	
Musca domestica L.,	Stigmatomyces Baeri Peyritsch.
NYCTERIBIDÆ.	
Acrocholidia Montaguei Kol.,	Helminthophana Nycteribiæ Peyritsch.
Megistopoda Westwoodii Kol.,	" " "
Nycteribia Dufourii,	" " "

NEUROPTERA.

Name of Host Insect.	Name of Parasite.
TERMITES.	
Termes mozambica Hagen,	Laboulbenia Hageni Thaxter.

ARACHNIDA.

Name of Host Insect.	Name of Parasite.
GASMIDÆ.	
Antennophorus caput-carabis,	Laboulbenia armillaris Berlese.

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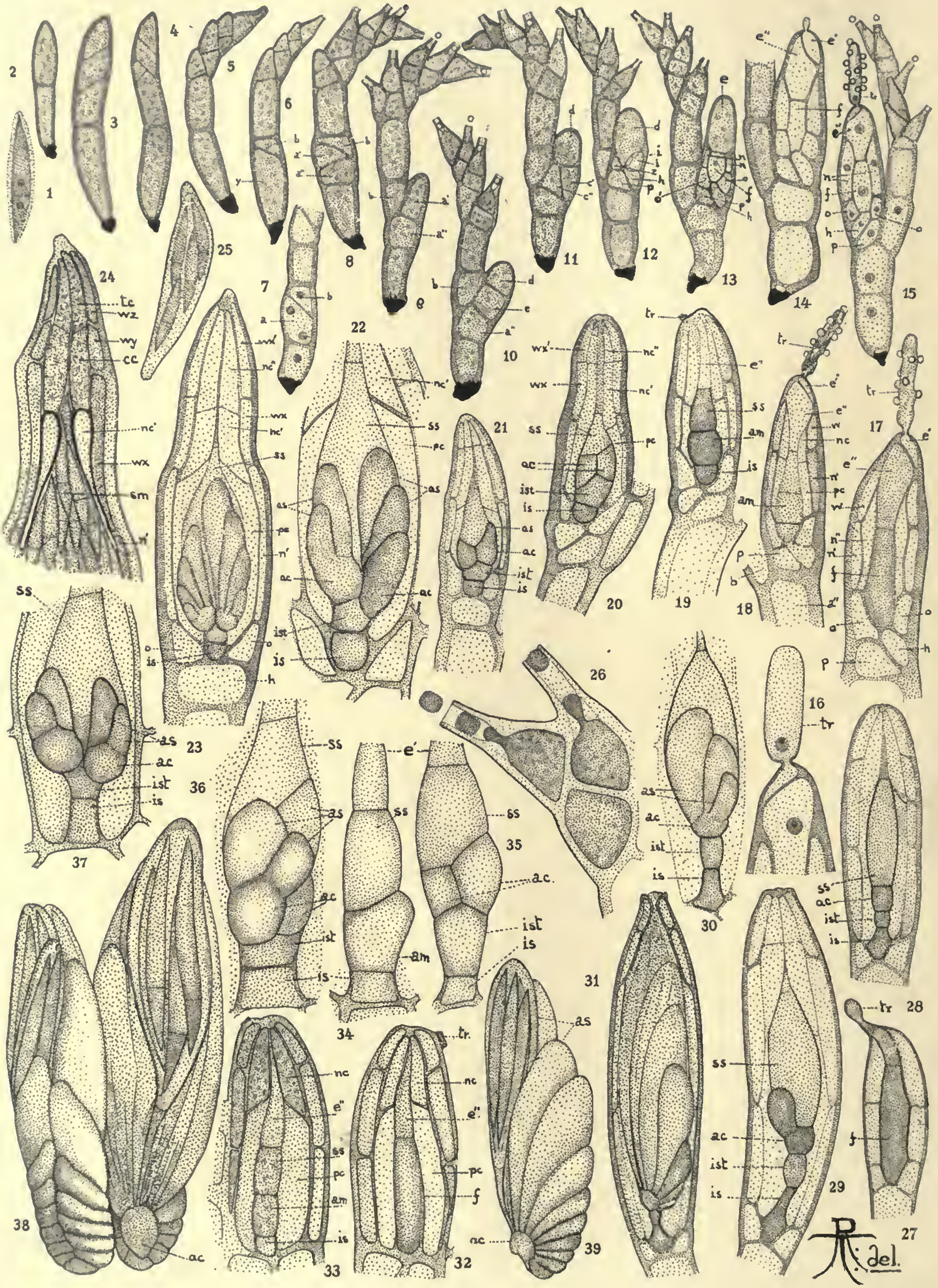

THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

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DESCRIPTIONS OF THE PLATES.

Note. — The following figures have been reproduced, by photo-lithography and the heliotype process, from ink drawings made with a camera lucida, and have been slightly reduced from the originals. The letters and numbers following the descriptions of the figures indicate the combinations of Zeiss objectives and eye-pieces used in each case.

DESCRIPTION OF PLATE I.

Stigmatomyces Baeri Peyritsch. p. 299

Figs. 1 to 15. Successive stages from the spore to the formation of the mature female organ. See p. 218. All J 2. p. 299

Fig. 16. Terminal portion of young perithecium, showing nucleated trichogyne and trichophoric cell before fertilization. J 4.

Fig. 17. Young perithecium in which fertilization has just been accomplished. J 2.

Figs. 18, 19. Young perithecium after fertilization. The first divisions of the carpogenic cell have taken place. J 2.

Fig. 20. A more advanced condition in which the ascogonium has divided into four ascogenic cells (**ac**) and a secondary inferior supporting cell (**ist**). J 2.

Fig. 21. A somewhat more advanced condition of the same. J 2.

Fig. 22. A more advanced condition in which the asci have begun to bud from the ascogenic cells. A slightly oblique lateral view. J 2.

Fig. 23. A still more advanced condition showing the further development of the perithecial cells and their relations to the ascogenic and supporting cells. An optical section seen antero-posteriorly. J 2.

Fig. 24. Terminal portion of a mature perithecium just before the first spore discharge. The upper and lower series of canal cells (**tc** and **c**) are still intact, the latter beginning to be pressed apart by the spore mass (**sm**). The inferior canal-cells (**nc**) have become somewhat modified through the thickening of their walls, and form a diaphragm between the general cavity of the perithecium and that of the neck. J 2.

Fig. 25. A single four-spored ascus isolated. J 2.

Fig. 26. Terminal portion of an appendage showing two antheridial cells with antherozoids both mature and in process of formation. J 12.

Peyritschiella geminata Thaxter. p. 280

Fig. 27. Young perithecium, in which the trichogyne has not been fertilized. $\frac{1}{12}$ 4.

Fig. 28. Young perithecium after fertilization in which the carpogenic cell has divided into the inferior and superior supporting cells while the ascogonium has divided into a single ascogenic cell (**ac**) and a secondary inferior supporting cell (**ist**). $\frac{1}{12}$ 4.

Figs. 29, 30. More mature condition in which the asci have begun to bud from the ascogenic cell. $\frac{1}{12}$ 4.

Fig. 31. Mature perithecium showing the ascogenic cell and the mass of asci developed from it still supported by the two inferior supporting cells, which will soon be wholly destroyed, leaving the ascus mass free within the cavity of the perithecium. $\frac{1}{12}$ 2.

Laboulbenia elongata Thaxter. p3/12

Fig. 32. Young perithecium after fertilization, the insertion only of the trichogyne being visible (**tr**). The carpogenic cell (**f**) has not yet divided. $\frac{1}{12}$ 2.

Fig. 33. The carpogenic cell has divided into the inferior and superior supporting cells and the ascogonium. $\frac{1}{12}$ 2.

Fig. 34. The ascogenic apparatus seen at a stage slightly more advanced than in the previous figure. The ascogonium has begun to grow upward on the right before the formation of septa. J 4.

Fig. 35. Ascogenic apparatus in which the ascogonium has divided into two ascogenic cells (**ac**) and a secondary inferior supporting cell (**ist**). J 4.

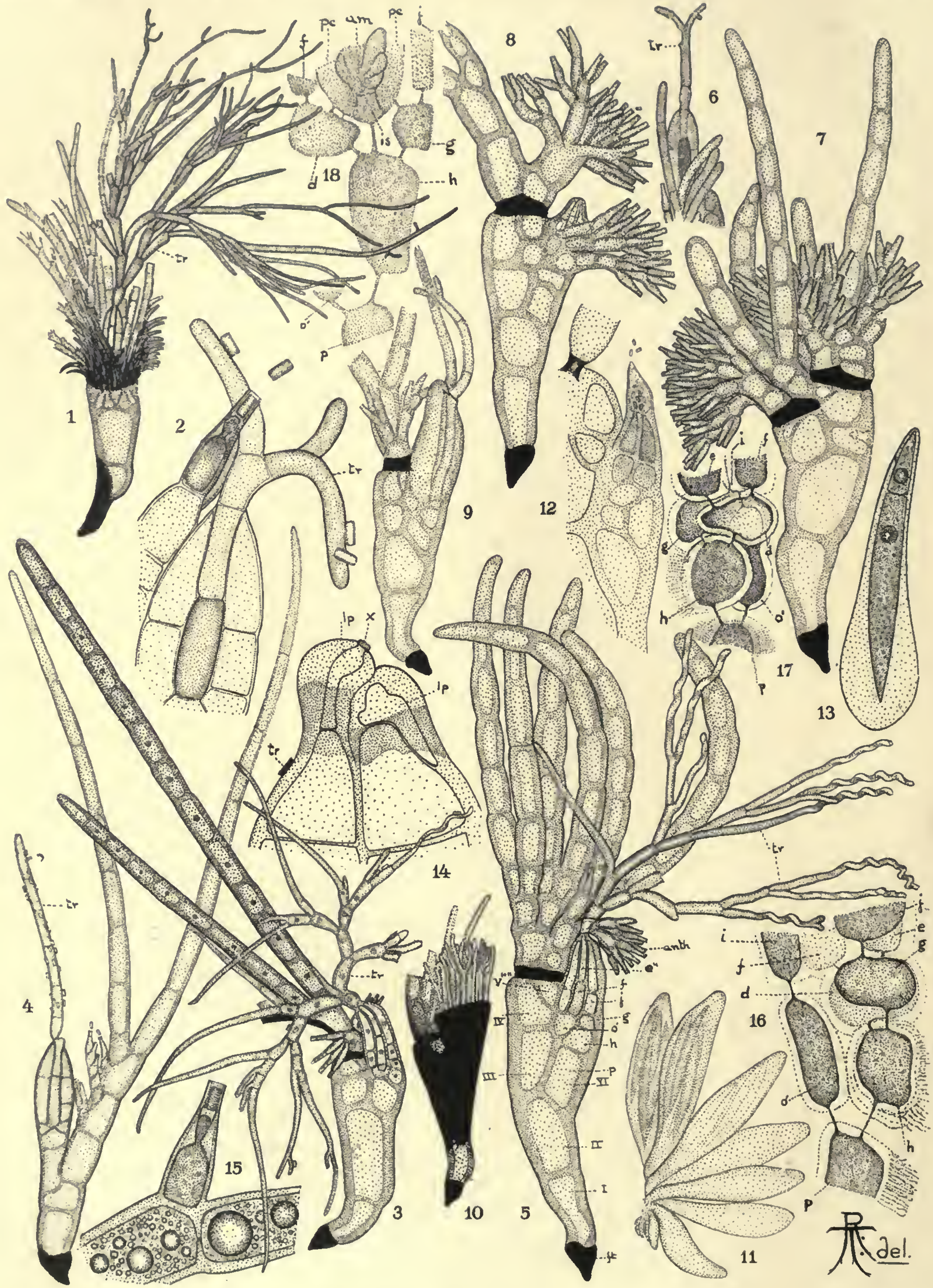
Fig. 36. A more advanced stage, in which the asci (**as**) have begun to bud from the ascogenic cells. J 4. Figs. 32–36 represent lateral views.

Fig. 37. Antero-posterior view of the ascogenic apparatus, showing the two ascogenic cells lying side by side and beginning to separate while the asci have already begun to bud. D 12.

Fig. 38. Two ascogenic cells with asci attached seen as they lie free within the cavity of the perithecium. That at the left seen dorsally, that at the right ventrally. J 2.

Fig. 39. Ascogenic cell with attached asci seen sidewise as it lies free within the cavity of the perithecium. J 2.

A detailed description of the figures on this plate will be found on pages 218–228 of the text. The letters correspond in all the figures, and the corresponding structures are as follows: (**c**) primordial cell of perithecium proper; (**d**) primordial cell of procarpe; (**o, o′**) basal cells of perithecium; (**i, i, z**) primordial cells of perithecial wall-cells, the parietal, and the canal-cells; (**f**) carpogenic cell; (**e″**) trichophoric cell; (**e′**) base of trichogyne (**tr**); (**nc′, w, wx, wy, wz**) wall-cells of the perithecium; (**wz**) lip-cells; (**pc**) parietal cells of perithecium; (**nc′, cc, tc**) canal-cells of perithecium; (**p**) stalk-cell of perithecium; (**h**) secondary stalk-cell; (**o′**) posterior basal cell; (**o**) one of two anterior basal cells; (**nn**) primordial wall-cells; (**am**) ascogonium; (**is**) inferior supporting cell; (**ss**) superior supporting cell; (**ist**) secondary inferior supporting cell; (**ac**) ascogenic cells; (**as**) asci; (**sm**) ascus mass.



THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

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DESCRIPTION OF PLATE II.

Teratomyces mirificus Thaxter. p. 355

Fig. 1. Young individual. A young perithecium in the centre bears terminally a highly developed branching trichogyne. D 2.

Laboulbenia cristata Thaxter. p. 330

Fig. 2. Young perithecium with antheridia above at the right. The darker axile cell the carpogonium, above it the trichophoric cell terminated by the trichogyne, on which are several antherozoids. Leitz oil $\frac{1}{12}$ 4.

Fig. 3. Young individual with much more highly developed trichogyne, many of the cells of which are distinctly nucleated. The cells of the dark rigid appendages at the left also nucleated. D 2.

Rhadinomyces pallidus Thaxter. p. 306

Fig. 4. Young individual with simple trichogyne, on which are numerous antherozoids. D 4.

Laboulbenia elongata Thaxter. p. 312

Fig. 5. Young individual with well-developed trichogyne, the tips of which are spirally twisted. A fertile branch bearing numerous antheridia projects across the basal cell of the trichogyne. D 2.

Rhachomyces lasiophorus Thaxter. p. 360

Fig. 6. Young perithecium with branched trichogyne; at its base several young sterile appendages, and at the left an antheridium. D 4.

Laboulbenia elongata Thaxter. p. 312

Fig. 7. Abnormal form on which no perithecium has developed, but in its place the usual blackened insertion-cell bearing sterile and fertile appendages, the latter with great numbers of antheridia. D 2.

Fig. 8. Abnormal form in which the perithecium at the right has not developed, the cells at its base having sent out branches on which are numerous antheridia. D 2.

Laboulbenia paupercula Thaxter. p. 314

Fig. 9. Abnormal form in which the ascogenic cells have not developed, while the cells at the base of the perithecium have sent up within it sterile branches, the tips of which project through the terminal pore. D 2.

Laboulbenia parvula Thaxter. p. 329

Fig. 10. Specimen in which the perithecium has been broken off while the cells at its base have sent up within it numerous sterile branches. D 2.

Dichomyces princeps Thaxter. p 284

Fig. 11. Group of asci isolated by crushing. The three terminal asci show ascospores within and all are adherent to the remains of the ascogenic cell. Leitz $\frac{1}{12}$ 2.

Peyritschiella curvata Thaxter. p 279

Fig. 12. Antheridium at the right, showing terminal pointed slightly inflated receptacle into which the antherozoids are discharged from the cells just below it. Leitz oil $\frac{1}{12}$ 4.

Laboulbenia elongata Thaxter. p. 312

Fig. 13. Spore showing nuclei. $\frac{1}{12}$ 2.

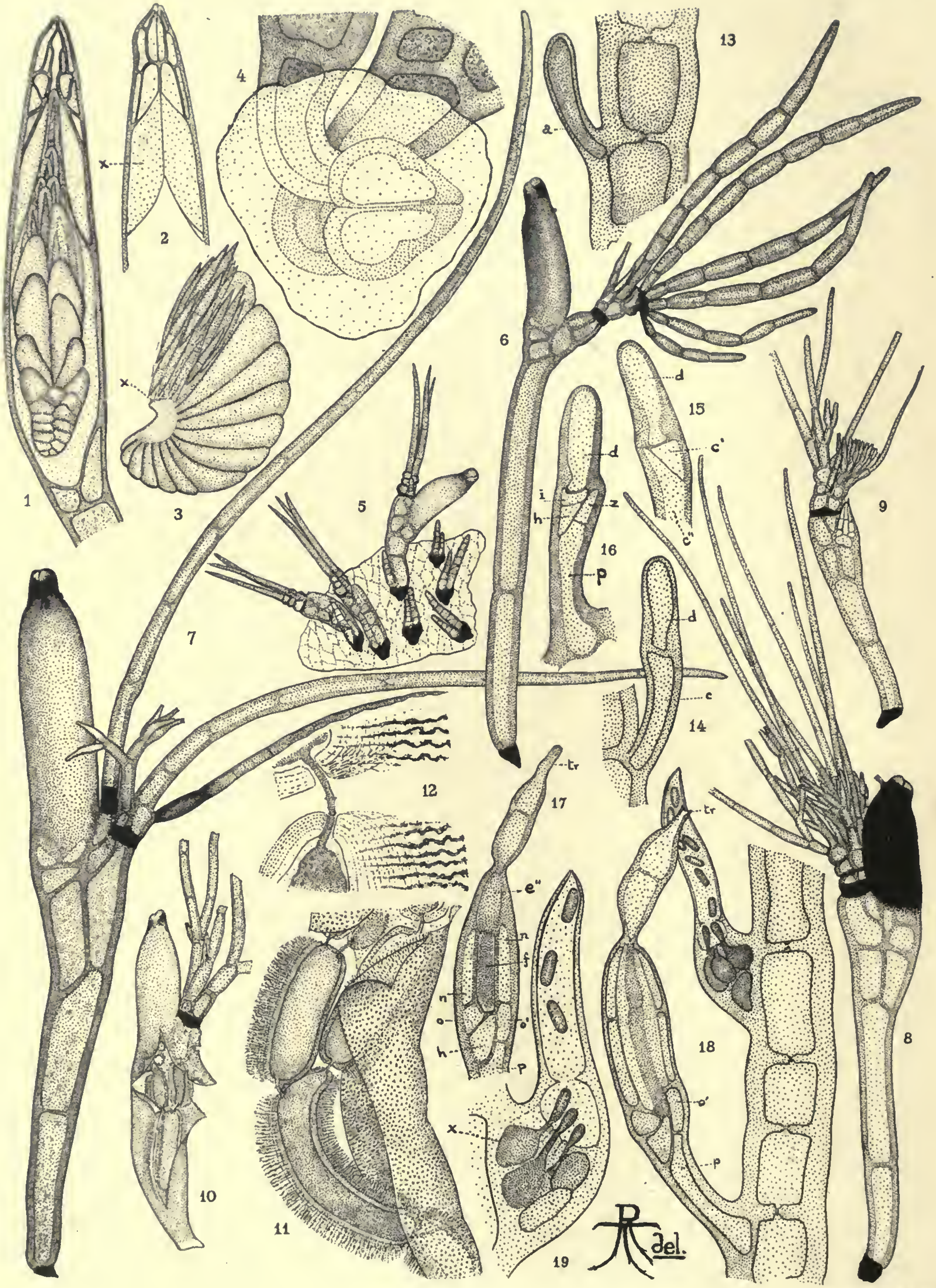
Fig. 14. Terminal portion of perithecium showing structure of lip-cells (**lp**), insertion of trichogyne (**tr**), and "valve" of posterior lip-cell (**x**). $\frac{1}{12}$ 4.

Fig. 15. Portion of fertile branch bearing an antheridium, its structure shown in optical section. $\frac{1}{12}$ 4.

Fig. 16. Protoplasmic connections of the "stalk-cell" and basal cells of the perithecium indicating the successive origin of each. Drawn from a specimen in which the cells had been treated with potash and stained with eosin. The appendage lies at the left. J 2.

Fig. 17. A specimen similarly treated and viewed from the opposite side. The appendage lies at the right. In both figures the stalk-cell is marked (**p**), the posterior basal cell (**o′**), the secondary stalk-cell (**h**), the anterior basal cells, left (**g**), right (**d**), and the four basal wall-cells of the perithecium (**e, i, f, j**), the cell (**j**) not being visible in fig. 17. J 2.

Fig. 18. A specimen similarly treated, slightly crushed so as to separate the basal cells without destroying the ascus mass and the inferior supporting cell, the protoplasmic connection of which with the secondary stalk-cell (**h**) is unbroken, as well as the connections of the two anterior basal cells with the parietal (**pc**) and wall (**f, j**) cells above them. The protoplasmic portions only of these cells are indicated, the lettering corresponding to that of the two previous figures, except that (**is**) represents the inferior supporting cell of the ascus apparatus, (**am**) the ascus mass and ascogenic cells, and (**pc**) the parietal cells of the perithecium.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE III.

Sphaleromyces Lathrobii Thaxter. p. 365

Fig. 1. Mature perithecium seen in optical section, showing dorsal view, the ascogenic cell with attached asci lying free in the cavity of the perithecium. The ascogenic cell itself lies on the opposite side, and is not seen in the figure. $\frac{1}{12}$ 2.

Fig. 2. Terminal portion of a somewhat younger perithecium seen laterally in optical section. $\frac{1}{12}$ 2.

Rhizomyces ctenophorus Thaxter. p. 308

Fig. 3. Ascogenic cell with attached asci showing oblique position of the mass as it lies free in the cavity of the perithecium. Only a small portion of the spore mass is shown, which fills the cavity of the perithecium above the ascogenic cell, the spores being freed through the sloughing off of the asci as they mature from the upper portion of the ascogenic cell (at **x**), and the absorption of the ascus wall. J 2.

Laboulbenia Hageni Thaxter. p. 328

Fig. 4. Portion of the soft integument from the abdomen of a white ant, bearing a pair of individuals, inverted so as to show the attachment of the foot as it appears when viewed from below. J 4.

Laboulbenia inflata Thaxter. p. 327

Fig. 5. Portion of the hard chitinous integument from the leg of Bradycellus, showing seven pairs of individuals in various stages of development, and illustrating the abortion, characteristic of this species, of one member of the pair. C 2.

Laboulbenia Diopsis Thaxter. p. 331

Fig. 6. Mature individual of average dimensions. A 12.

Laboulbenia proliferans Thaxter. var. *liberiana.* p. 349

Fig. 7. Mature individual of the Liberian variety, the proliferous appendage having the black indurated base. A 12.

Laboulbenia Aspidoglossæ Thaxter. p. 342

Figs. 8, 9. Mature and young individuals. A 12.

Laboulbenia elongata Thaxter. p. 312

Fig. 10. Individual treated with potash, showing the general envelope ruptured by longitudinal and transverse slits exposing the cells within. A 4.

Fig. 11. Portion of an individual similarly treated. Cells II, III, and VI seen in optical section protruding from the ruptured envelope. The dots on the surface of the latter correspond to the points of attachment of the fibrillæ which arise from the inner layers of the cell-walls on the surfaces next to the envelope. The protoplasmic connection of the different cells is indicated. D 2.

Fig. 12. The adjacent ends of cells III and IV from an individual similarly treated, showing fibrillæ and protoplasmic connection. $\frac{1}{12}$ 12.

Enarthromyces indicus Thaxter. p276

Fig. 13. Portion of the axis of the receptacle, showing the bud (a) from which the perithecium and its stalk-cell are formed. D 4.

Fig. 14. The bud (a) of the previous figure has become divided by a transverse partition into two superposed cells (c and d). D 4.

Fig. 15. The cell (c) of the previous figure has become divided into a lower cell (c″), the stalk-cell, and an upper cell (c′), the primordial cell of the perithecium, the cell (d) being the primordial cell of the procarpe. D 4.

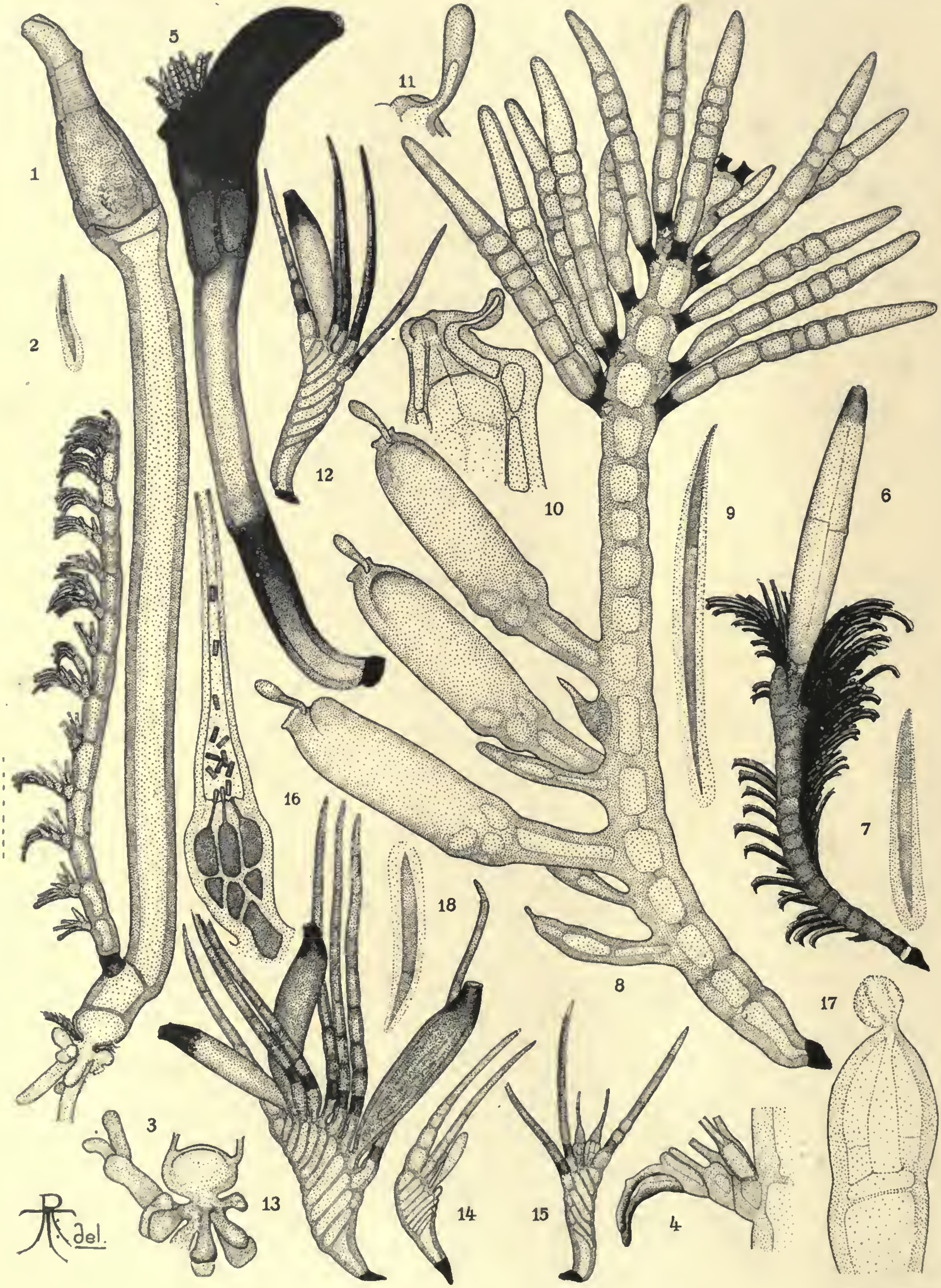
Fig. 16. The cell (c′) has divided into four cells, which are beginning to grow up around the base of (d). D 4.

Fig. 17. A more advanced stage. The cells (i, i) of the previous figure are divided by transverse septa and have grown up around the base of the cell (d), which has now developed into a mature procarpe, (f) the carpogenic cell, (e″) the tricophoric cell, (tr) the trichogyne, the narrow tip of which is alone receptive. $\frac{1}{12}$ 2.

Fig. 18. Portion of the axis of a receptacle showing relative position of the young perithecium and of the antheridium. The receptive tip of the trichogyne has collapsed, fertilization having presumably been accomplished. $\frac{1}{12}$ 2.

Fig. 19. Antheridium seen in optical section showing antherozoids mature in its cavity and in process of formation from its antheridial cells. $\frac{1}{12}$ 4

PLATE IV.



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THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE IV.

Rhizomyces ctenophorus Thaxter. p308

Fig. 1. Mature individual, showing a fragment of the host's integument adherent between the rhizoids and the basal cell. A 12.

Fig. 2. Spore. D 4.

Fig. 3. Rhizoids, but slightly broken, from another individual. D 2.

Fig. 4. Portion of axis of antheridial appendage showing antheridial branch with three antheridia at its base, and sterile terminal branchlets. $\frac{1}{12}$ 2.

Laboulbenia Orectogyri Thaxter. p 352

Fig. 5. Mature individual. A 12.

Rhachomyces arbusculus Thaxter. p. 362

Fig. 6. Mature individual. A 12.

Fig. 7. Spore. D 4.

Enarthromyces indicus Thaxter. p. 276

Fig. 8. Mature individual with three mature and three aborted perithecia. A 12.

Fig. 9. Spore. D 4.

Fig. 10. Tip of young perithecium, showing cell-structure. D 4.

Fig. 11. Process from one of dorsal lip-cells of mature perithecium. D 4.

Dimeromyces africanus Thaxter. p. 267

Figs. 12, 13. Mature female individuals with one and three mature perithecia respectively. A 12.

Fig. 14. Young female individual, showing origin of perithecia and appendages. A 12.

Fig. 15. Mature male individual with two antheridia. A 12.

Fig. 16. Optical section of antheridium, showing mature antherozoids free within the cavity of the antheridium neck and in process of formation from the antheridial cells. $\frac{1}{12}$ 4.

Fig. 17. Young perithecium, showing (remains of ?) trichogyne. $\frac{1}{12}$ 2.

DESCRIPTION OF PLATE V.

Dimorphomyces muticus Thaxter. p.267

Fig. 1. An old female individual in which four new perithecia are developing. One of the two primary perithecia is shown projecting to the left, and within it two fully developed male individuals. Posterior view. D 4.

Fig. 2. Male and female individuals *in situ* on edge of portion of abdominal ring of host. The male at the left; both viewed posteriorly and illustrating the juxtaposition of the sexes at the point of infection. The ascus group shown in left perithecium. D 4.

Fig. 3. Mature female individual with but two perithecia seen in optical section with ascus groups. Anterior view. D 4.

Fig. 4. Young female individual seen sidewise, its posterior face with the sterile terminal cells of the receptacle at the right. Of the two young perithecia the larger bears a terminal branched trichogyne, to which several antherozoids are affixed. D 12.

Fig. 5. Male and female individual developed from the same spore pair at the point of infection. The female at the right has two young perithecia with terminal trichogynes on which are several antherozoids. Posterior views. D 12.

Fig. 6. Young female individual seen sideways. D 12.

Fig. 7. Tip of perithecium. D 12.

Figs. 8 and 9. Two mature male individuals showing discharge of antherozoids. D 12.

Fig. 10. Spore. D 12.

Dimorphomyces denticulatus Thaxter. p.266

Fig. 11. Mature female individual. View in part anterior. D 4.

Fig. 12. Mature female individual seen posteriorly, a third young perithecium projecting at the right. D 4.

Fig. 13. Tip of perithecium. D 12.

Figs. 14 and 15. Two male individuals with antherozoids. D 12.

Fig. 16. Spore. D 12.

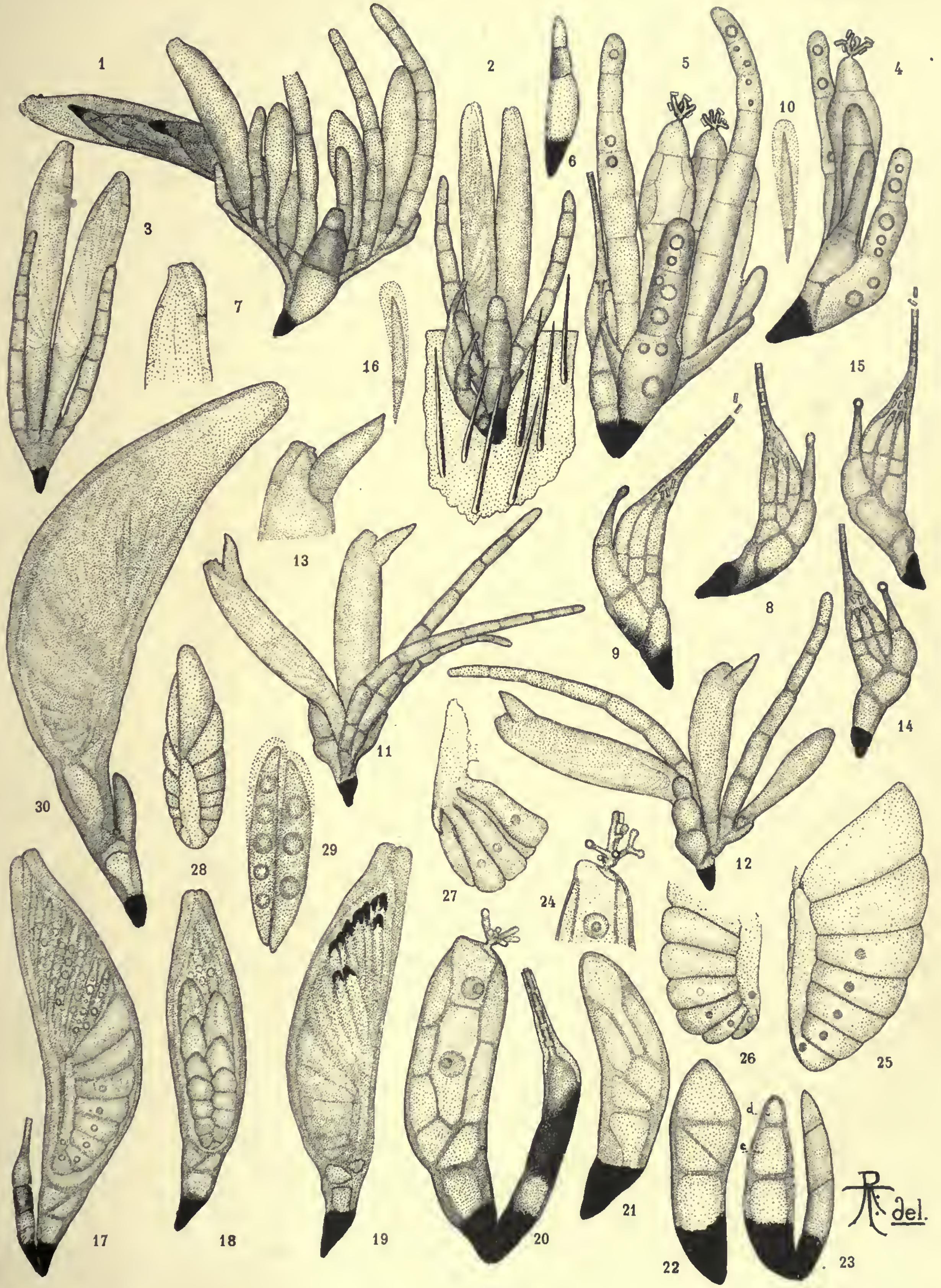
Amorphomyces Falagriæ Thaxter. p.296

Fig. 17. Male and female individual developed from the same spore pair at the point of infection. The perithecium of the female shown in optical section with the nucleated asci arising from the long ascogenic cell at the left. The ascus mass is viewed obliquely sidewise. The spore mass in the terminal portion of the perithecium consists of spore pairs freed through the absorption of the ascus walls. D 4.

Fig. 18. Female individual viewed anteriorly. The asci are shown arising alternately in a double row from the ascogenic cell, which lies behind. D 4.

Fig. 19. Mature female individual viewed sidewise. Many of the spore pairs in the terminal portion have begun to germinate, their blackened haustoria directed upward. D 4.

Fig. 20. Male and female individuals developed from the same spore pair. The female at the left terminated by a branching trichogyne, the carpogonium and trichophoric cell both distinctly nucleolated. The male at the right shows antherozoids before discharge. D 12.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

Fig. 21. Female individual before development of trichogyne. D 12

Fig. 22. Young female individual showing first three septa. D 12.

Fig. 23. Germinating spore pair, the male at the right. D 12.

Fig. 24. Terminal portion of young female individual with branching trichogyne on which is a single antherozoid. D 12.

Fig. 25. Ascus mass, showing origin of asci from ascogenic cell at the left. Leitz oil $\frac{1}{12}$ D. Figs. 17–25 drawn from living material.

Fig. 26. A view similar to the last, the asci somewhat shrunken by glycerine. $\frac{1}{12}$ D.

Fig. 27. Asci adhering to lower part of ascogenic cell, isolated from perithecium by crushing and treated with glycerine. The asci have been broken from the upper portion. Leitz oil. $\frac{1}{12}$ D.

Fig. 28. Ascus mass with ascogenic cell viewed anteriorly. The view opposite to that seen in fig. 18. D 4.

Fig. 29. Spore pair. The "male spore" at the left is slightly smaller. D 12.

Amorphomyces floridanus Thaxter. p. 297

Fig. 30. Mature individual. D 4.

DESCRIPTION OF PLATE VI.

Camptomyces melanopus Thaxter. p. 275

Figs. 1, 2. Mature individuals, posterior and nearly anterior views. D 2.

Fig. 3. Young individual with trichogyne and antherozoids. D 4.

Fig. 4. Young perithecium, showing trichogyne with antherozoids *in situ*, and large central carpogenic cell. D 12.

Figs. 5, 6. Lateral and anterior views of antheridium. D 12.

Peyritschiella geminata Thaxter. p. 280

Fig. 7. Mature individual with two terminal perithecia. D 2.

Fig. 8. Mature individual with single terminal perithecium. D 2.

Fig. 24. Spore. D 4.

Peyritschiella curvata Thaxter. p. 279

Fig. 9. Mature individual with antheridium at the right. D 2.

Fig. 10. Mature individual with antheridium at the left. D 2.

Fig. 11. Germinating spore. D 4.

Figs. 12–15. Successive stages in development. D 4.

Fig. 16. Young individual, the antheridium at the right, the immature perithecium terminated by the small trichogyne. D 4.

Fig. 17. Spore. D 4.

Fig. 18. Perithecium seen in section with contained ascus mass. No spores have been discharged, and the canal-cells of the tip are not yet destroyed. Leitz oil $\frac{1}{12}$ 2.

Peyritschiella minima Thaxter. p. 280

Figs. 19, 20. Two mature individuals, the antheridium shown (in 19) at the right. D 2.

Fig. 21. *nec del.*

Peyritschiella nigrescens Thaxter. p. 281

Figs. 22, 23. Mature specimen seen from both sides, the antheridium at the right in (23).

Fig. 24. See *sub P. geminata.*

Dichomyces furciferus Thaxter. p. 282

Fig. 25. Mature individual, posterior view, showing antheridia. D 2.

Fig. 26. Mature individual, anterior view. D 2.

Fig. 27. Tip of perithecium, posterior view. D 12.

Fig. 28. Tip of perithecium, anterior view. D 12.

Fig. 29. Spore. D 4.

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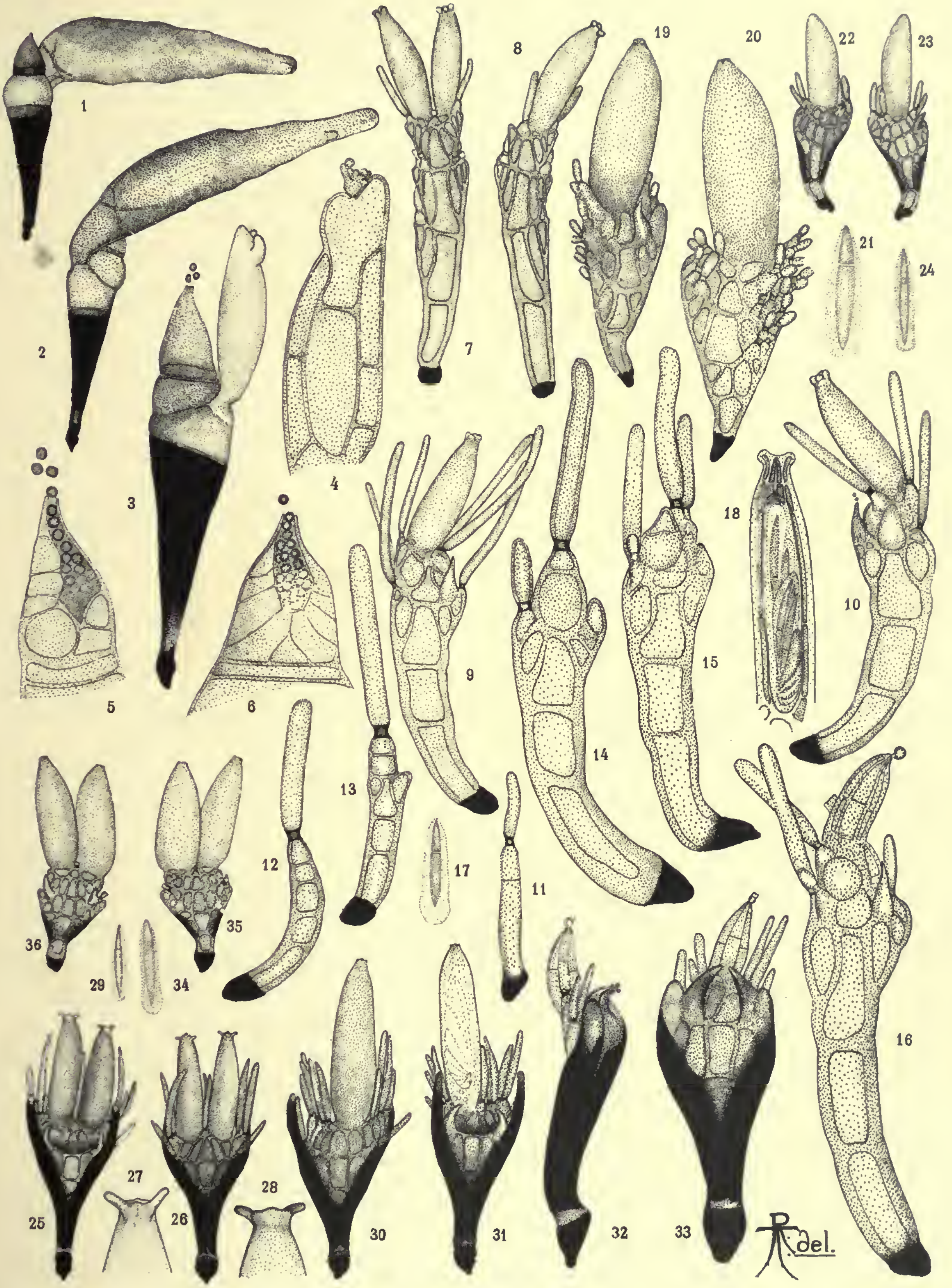
PLATE VI.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

Dichomyces inæqualis Thaxter. p. 283

Fig. 30. Mature individual, anterior view. D 2.

Fig. 31. Mature individual, posterior view, showing antheridia. D 2.

Fig. 32. Young individual, seen laterally; antheridium at the right discharging antherozoids; the young perithecium terminated by a small trichogyne, on which is a single antherozoid. D 4.

Fig. 33. The same, posterior view. D 4.

Fig. 34. Spore. D 4.

Dichomyces infectus Thaxter. p. 284

Figs. 35, 36. Anterior and posterior view of the same specimen. D 2.

DESCRIPTION OF PLATE VII.

Haplomyces californicus Thaxter. p.269

Figs. 1, 2. Mature individuals. D 2.

Fig. 3. Antheridium enlarged. D 4.

Fig. 4. Spore. D 4.

Haplomyces texanus Thaxter. p.270

Fig. 5. Nearly mature individual with hyaline receptacle. D 2.

Fig. 6. Mature individual. The sub-basal cell of the receptacle and the basal cell of the antheridium deeply blackened. D 2. Fig. 2*a*. Spore.

Haplomyces virginianus Thaxter. p.270

Figs. 7 and 8. Two mature individuals. D 2.

Fig. 9. Antheridium enlarged. D 12.

Fig. 10. Spore. D 4.

Cantharomyces pusillus Thaxter. p.273

Fig. 11. Immature individual, the base of the trichogyne still adherent near the tip on the inner side. D 4.

Figs. 12, 13. Two mature individuals, with simple and branched appendage. D 2.

Fig. 14. Two spores. D 4.

Cantharomyces occidentalis Thaxter. p. 272

Figs. 15, 16. Two mature individuals: the tips of the appendages broken. D 2.

Cantharomyces Bledii Thaxter. p.271

Fig. 17. Mature individual. D 2.

Fig. 18. Mature individual, the sub-basal cell of receptacle partly blackened and producing two perithecia. D 2.

Fig. 19. Germinating spore. D 4.

Fig. 20. Young individual, with remains of trichogyne. D 4.

Fig. 21. Young individual: the immature perithecium consisting of two superposed cells projecting at the left. D 4.

Fig. 22. Antheridium enlarged. D 12.

Fig. 23. Spore. D 4.

Fig. 24. Young individual from which the perithecium has not yet begun to develop. D 4.

Eucantharomyces Atrani Thaxter. p.274

Fig. 25. Nearly mature individual (the tip of the antheridium supplied). D 2.

Fig. 26. Younger individual. D 2.

Fig. 27. Antheridium enlarged. D 4.

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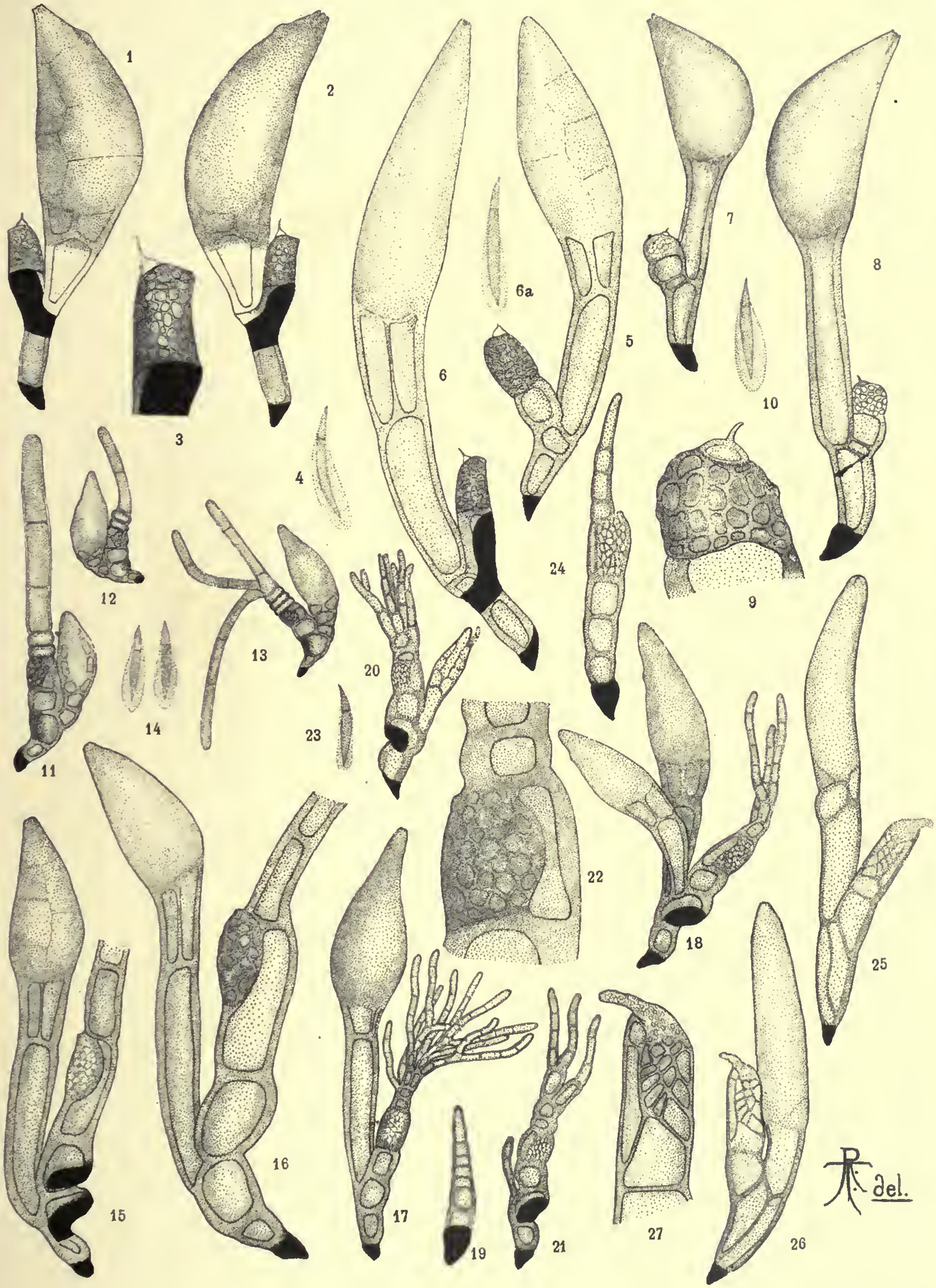

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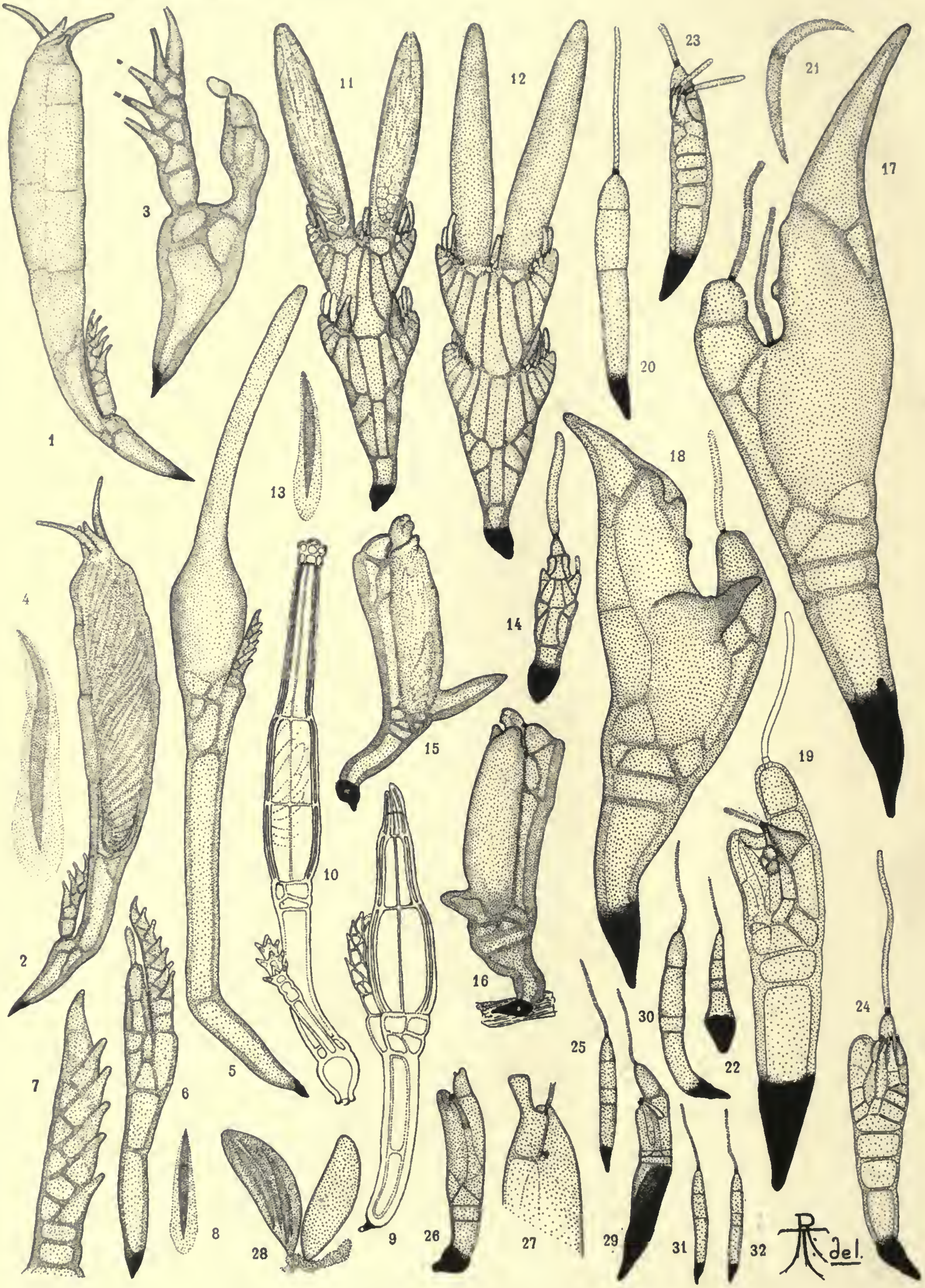

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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE VIII.

Stigmatomyces virescens Thaxter. p. 301

Figs. 1, 2. Two mature individuals (2) showing spore and ascus mass. A 12.

Fig. 3. Young individual, the antheridium with discharged antherozoids at the left; the young perithecium with terminal trichogyne at the right. D 4.

Fig. 4. Spore. D 4.

Stigmatomyces entomophilus (Peck) Thaxter. p. 300

Fig. 5. Mature individual. A 12.

Fig. 6. Young individual with antheridium at the right and young perithecium with terminal trichogyne at the left. D 4.

Fig. 7. Antheridium enlarged. D 12.

Fig. 8. Spore. D 4.

Stigmatomyces Baeri (Knoch) Peyritsch. p. 299

Fig. 9. Mature individual (after Peyritsch).

Helminthophana Nycteribiæ Peyritsch. p. 298

Fig. 10. Mature individual (after Peyritsch).

Dichomyces princeps Thaxter. p. 284

Fig. 11. Mature individual, posterior view. D 2.

Fig. 12. Mature individual, anterior view. D 12.

Fig. 13. Spore. D 4.

Fig. 14. Young individual.

Chitonomyces spinigerus Thaxter. p. 288

Figs. 15, 16. Two mature individuals. D 2.

Chitonomyces paradoxus Peyritsch. p. 287

Figs. 17, 18. Two individuals seen from opposite sides. D 2.

Fig. 19. Young individual seen in optical section. The ascogenic cell has divided into three parts, and seems to be connected with the base of a trichogyne (?) The perithecium has begun to grow out laterally at the left. $\frac{1}{12}$ 2.

Fig. 20. Young individual, showing first cell divisions. D 4.

Fig. 21. Spore. D 4.

Hydræomyces Halipli Thaxter. p. 294

Fig. 22. Young individual, showing first divisions. D 4.

Fig. 23. Young individual in which the lower appendages have developed. D 4.

Fig. 24. Young individual, the three lower appendages with their basal cells at the right; at the left the young perithecium, and between them the ascogenic cell and trichophoric cell. Leitz oil $\frac{1}{12}$ 2.

Chitonomyces marginatus Thaxter. p 289

Fig. 25. Young individual, showing first divisions. D 4.

Fig. 26. Young individual in which the terminal cell of the receptacle has just begun to proliferate. D 4.

Fig. 27. Terminal portion of young individual in which the proliferation is completed without having become blackened. D 12.

Fig. 28. Asci with ascospores. D 12.

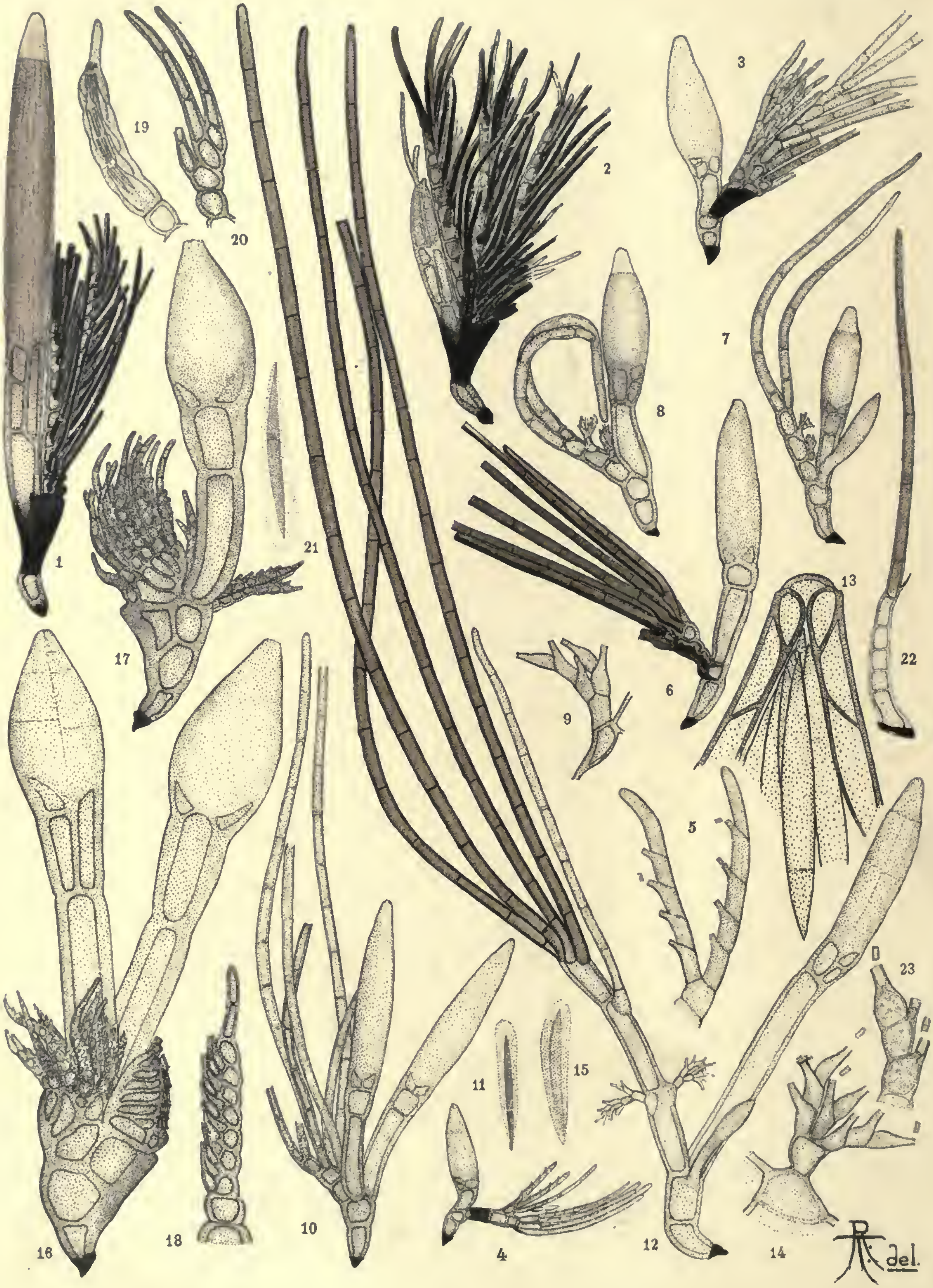
Chitonomyces affinis Thaxter. p. 291

Figs. 29, 30. Young individuals. D 4.

Chitonomyces minor Thaxter.

Figs. 31, 32. Young individuals, showing first divisions. D 4.

PLATE IX



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE IX.

Corethromyces Cryptobii Thaxter. p. 303

Fig. 1. Mature individual. The inner main appendage broken off at its base, the secondary appendages more or less broken. A 12.

Fig. 2. Young individual slightly crushed to show three main appendages with young perithecium terminated by remains of a branched trichogyne. A 12.

Corethromyces jacobinus Thaxter. p. 304

Fig. 3. Mature individual. A 12.
Fig. 4. Immature individual, showing position of antheridial branches. A 12.
Fig. 5. Single antheridial branch with two discharged antherozoids. D 12.

Corethromyces setigerus Thaxter. p. 305

Fig. 6. Nearly mature individual. The tips of the appendages are broken off. A 12.

Rhadinomyces pallidus Thaxter. p. 306

Fig. 7. Mature individual, developing a second perithecium. A 12.
Fig. 8. Mature individual of typical form. A 12.
Fig. 9. Antheridial branch. D 12.
Fig. 10. Mature individual of larger form (var. a), the branches mostly sterile. A 12.
Fig. 11. Spore of fig. 10. D 4.

Rhadinomyces cristatus Thaxter. p. 306

Fig. 12. Mature individual with two perithecia, one immature. A 12.

Fig. 13. Terminal portion of mature perithecium seen in optical section, the canal-cells having been destroyed. $\frac{1}{12}$ 4.

Fig. 14. Antheridial branch with discharged antherozoids. D 12.
Fig. 15. Spore. D 4.

Idiomyces Peyritschii Thaxter. p. 302

Fig. 16. Mature individual with two perithecia, the appendages all broken from the right side. A 12.

Fig. 17. Mature individual seen from opposite side. A 12.
Fig. 18. Antheridial appendage viewed laterally. D 4.
Fig. 19. Antheridial appendage; face view, showing three rows of antheridia. D 4.
Fig. 20. Sterile appendage. D 4.
Fig. 21. Spore. D 4.

Rhadinomyces cristatus Thaxter. p 306

Fig. 22. Young individual, showing spinous process at base of primary appendage. D 4.

Fig. 23. Antheridial branchlet of three superposed antheridia, showing structure in optical section. $\frac{1}{12}$ 4.

DESCRIPTION OF PLATE X.

Teratomyces brevicaulis Thaxter. p. 357

Fig. 1. Mature individual with three perithecia. A 12.

Fig. 2. Single appendage. D 4.

Fig. 3. Spore. D 4.

Teratomyces mir~~abili~~s ificus Thaxter. p. 355

Fig. 4. Mature individual with two perithecia, one immature. A 12.

Fig. 5. Single appendage from mature individual. The antheridia and lateral branches have been broken off towards its base. D 4.

Fig. 6. Young appendage bearing a row of antheridia at the left. D 4.

Fig. 7. Spore. D 2.

Teratomyces Quedianus Thaxter. p. 356

Fig. 8. Mature individual.

Teratomyces Actobii Thaxter. p. 356

Fig. 9. Mature individual. A 12.

Fig. 10. Individual not quite mature with three perithecia. The base of the trichogyne still adherent to that on the right, the two at the left seen in optical section before any spores have been discharged. A 12.

Fig. 11. Appendage with antheridia and two discharged antherozoids. D 4.

Fig. 12. Mature appendage. Two old antheridia near the base. D 4.

Figs. 13–15. Young individuals in various stages of development. D 4.

Fig. 16. Spore. D 4.

Fig. 17. Trichogyne and young perithecium seen in optical section. D 4.

Diplomyces Actobianus Thaxter. p. 358

Figs. 18, 19. Mature individuals, posterior and anterior views. A 12.

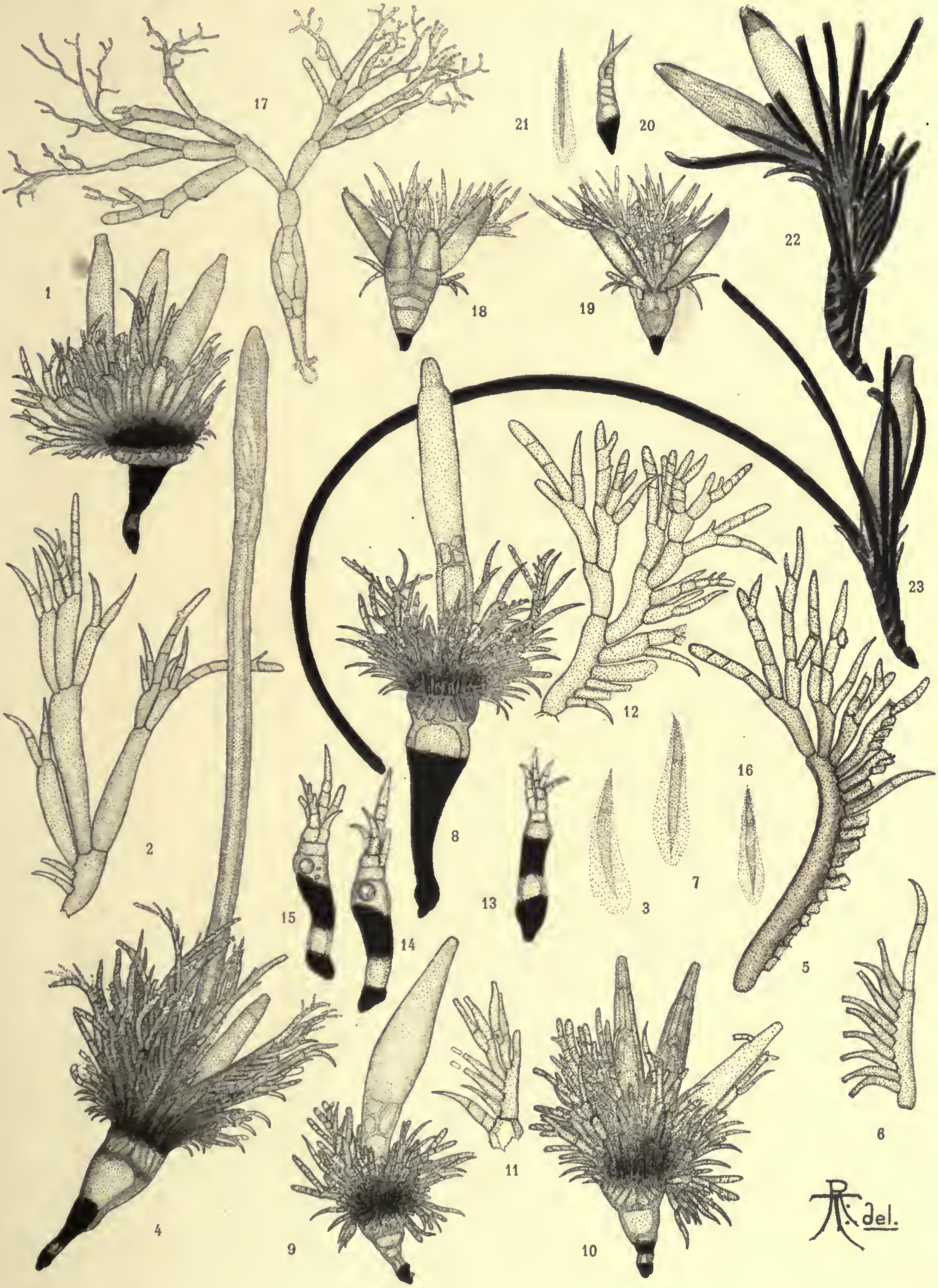
Fig. 20. Young individual. D 4.

Fig. 21. Spore. D 4.

Rhachomyces Lathrobii Thaxter. p. 363

Fig. 22. Mature individual with two perithecia. The receptacle has apparently become proliferous through the abortion of the first perithecium. The longer appendages are broken. A 12.

Fig. 23. Mature individual of typical form. A 12.



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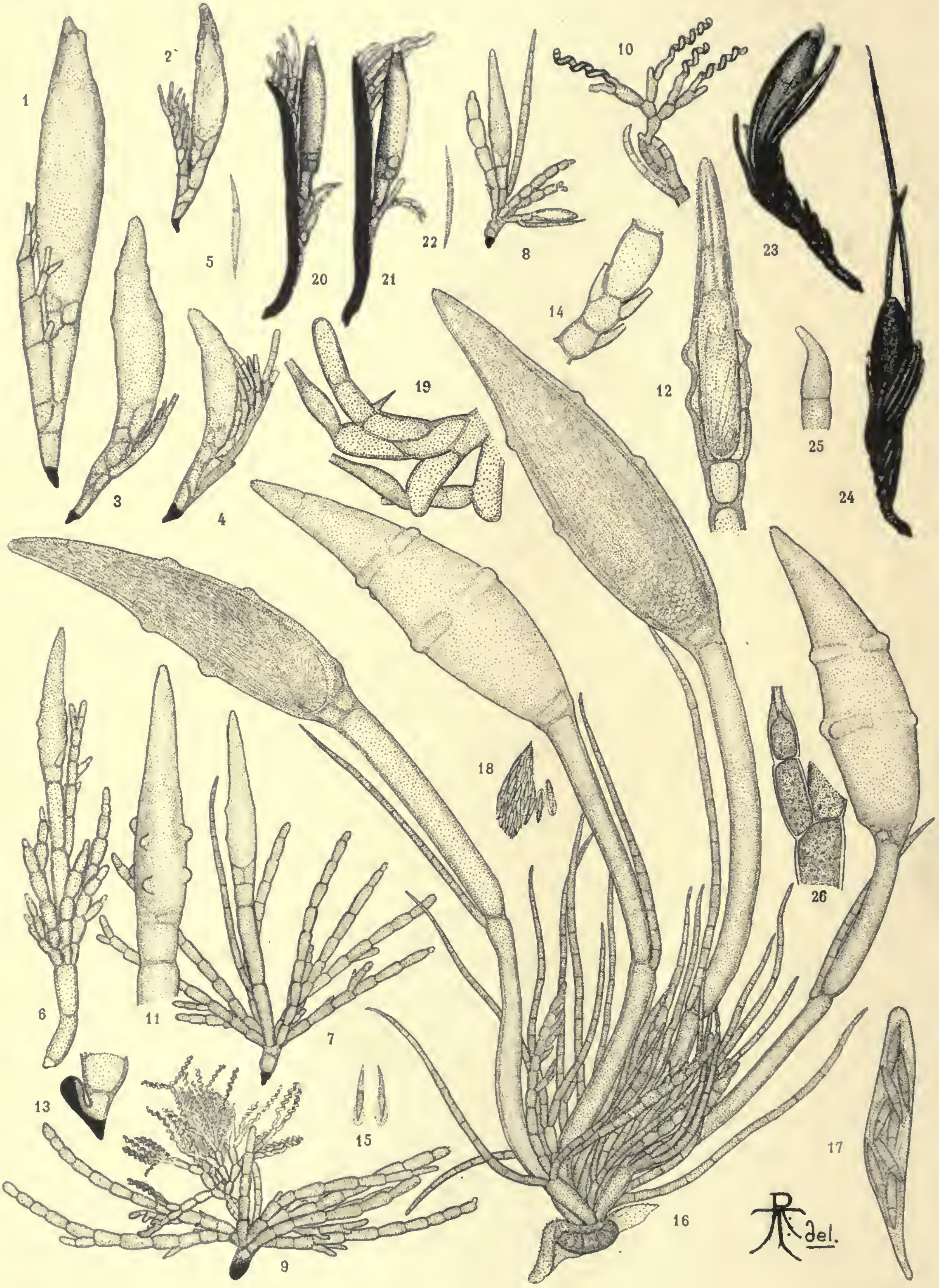
THAXTER--MONOGRAPH OF LABOULBENIACEÆ.



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THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XI.

Sphaleromyces occidentalis Thaxter. p. 366

Fig. 1. Mature individual. A 12.

Sphaleromyces Lathrobii Thaxter. p. 365

Figs. 2, 3. Mature individuals. A 12.

Fig. 4. Younger individual, more highly magnified. D 4.

Fig. 5. Spore. D 4.

Fig. 19. Terminal portion of appendage of a young individual, showing three antheridia and spinous process. $\frac{1}{12}$ 4.

Compsomyces verticillatus Thaxter. p. 367

Fig. 6. Mature individual: the two basal cells unusually elongate, the branch from the stalk of the perithecium somewhat abnormal. A 12.

Fig. 7. Mature individual, normal form. A 12.

Fig. 8. Mature individual developing a second perithecium at the right. A 12.

Fig. 9. Young individual, showing young perithecium and its very highly developed spirally twisted trichogyne. A 12.

Fig. 10. A young perithecium with much less highly developed trichogyne. D 12.

Fig. 11. Perithecium enlarged, showing prominences. D 4.

Fig. 12. Perithecium seen in optical section with contained ascus mass before any spore discharge has occurred. D 4.

Fig. 13. Peculiar modification of basal cell of receptacle. D 4.

Fig. 14. Portion of appendage with lateral antheridia. D 12.

Fig. 15. Two spores. D 4.

Moschomyces insignis Thaxter. p. 369

Fig. 16. Mature individual with four perithecia, two of which are shown in optical section with their spore masses, that at the left showing lateral view of ascogenic cell at its base, the other showing the round tips of the numerous asci. The cellular haustorium is shown projecting through a fragment of the soft chitinous integument of the host torn off when the fungus was removed. A 12.

Fig. 17. An ascus with eight ascospores; its stalk partly broken off. Leitz oil $\frac{1}{12}$ 4.

Fig. 18. One of the masses of coherent spores discharged from the perithecium. D 4.

Fig. 19. See above sub *Sphaleromyces Lathrobii.*

Chætomyces Pinophili Thaxter. p. 364

Figs. 20, 21. Two mature individuals. A 12.

Fig. 22. Spore. D 4.

Rhachomyces speluncalis Thaxter. p. 360

Fig. 23. Mature individual, the receptacle apparently proliferous. A 12.

Fig. 24. Mature individual typical form. A 12.

Fig. 25. Antheridium. D 4.

Moschomyces insignis Thaxter. p. 369

Fig. 26. Portion of fertile appendage with branchlet terminated by an antheridium. J 4.

DESCRIPTION OF PLATE XII.

Rhachomyces furcatus Thaxter. p. 362

Fig. 1. Spore. D 4.

Fig. 2. Mature individual: the first perithecium on the left has aborted, and the mature perithecium is borne on a proliferation of the receptacle. A 12.

Fig. 3. Mature individual, normal form. A 12.

Rhachomyces longissimus Thaxter. p. 361

Fig. 4. Mature individual. A 12.

Fig. 5. Spore.

Rhachomyces hypogæus Thaxter. p. 361

Fig. 6. Mature individual. A 12.

Rhachomyces lasiophorus Thaxter. p. 360

Figs. 7, 8. Mature individuals on Atranus, posterior and lateral views. A 12.

Fig. 9. Spore.

Figs. 10, 11. Young individuals, showing first divisions of sub-basal cell. D 4.

Rhachomyces pilosellus (Robin) Thaxter. p. 363

Figs. 12, 13. Two mature individuals. A 12.

Fig. 14. Individual with three aborted perithecia, the receptacle twice proliferous. A 12.

Fig. 15. Antheridium? Similar organs are shown in fig. 13, at the right. D 12.

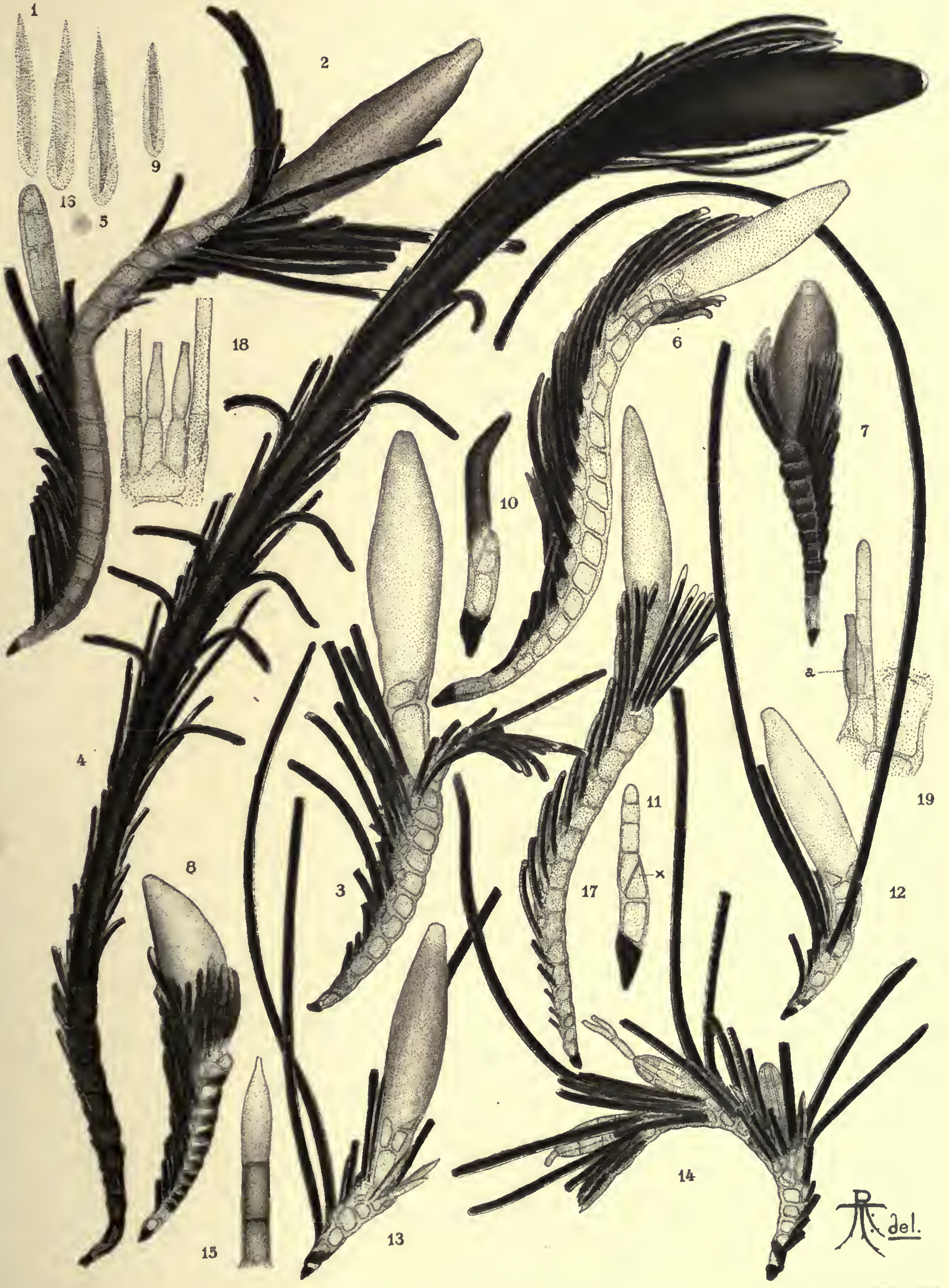
Fig. 16. Spore. D 4.

Rhachomyces lasiophorus Thaxter. p. 360

Fig. 17. Mature individual on *Badister micans*. A 12.

Fig. 18. Semi-diagrammatic figure of a pair of antheridia with appendages on either side; posterior view. J 4.

Fig. 19. Position of antheridium seen sidewise, and outlined in part through the appendage which lies beside it. J 4.



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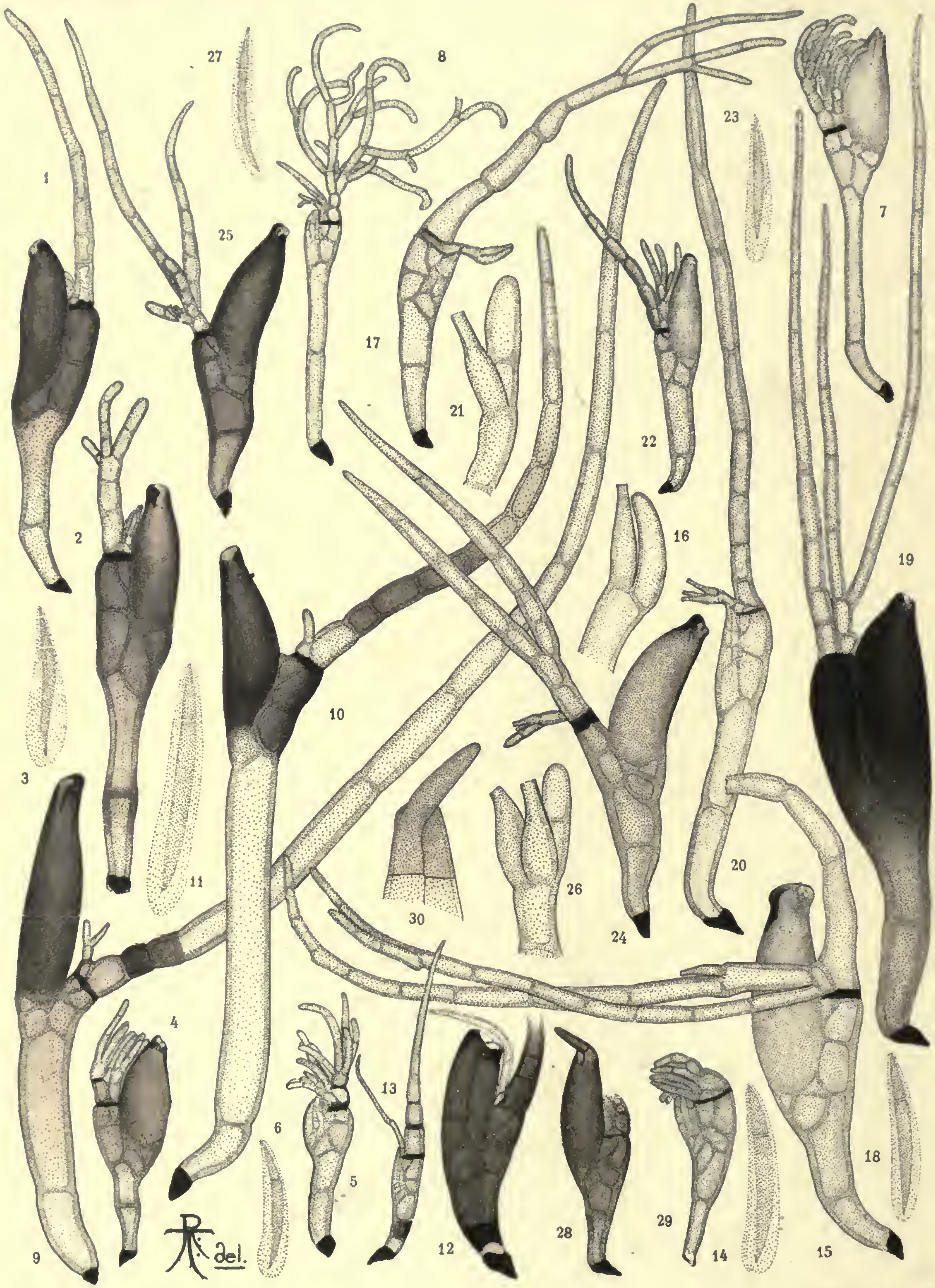
THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

PLATE XIII.



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THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XIII.

Laboulbenia vulgaris Peyritsch. p. 318

Figs. 1, 2. Two mature individuals. A 12.
Fig. 3. Spore. D 4.

Laboulbenia pedicillata Thaxter. p. 319

Fig. 4. Mature individual, short form. A 12.
Fig. 5. Young individual of short form. A 12.
Fig. 6. Spore. D 4.
Fig. 7. Mature individual, elongate form. A 12.
Fig. 8. Young individual of elongate form. A 12.

Laboulbenia subterranea Thaxter. p. 320

Figs. 9, 10. Two mature individuals. A 12.
Fig. 11. Spore. D 4.

Laboulbenia truncata Thaxter. p. 322

Fig. 12. Mature individual, the tip of the appendage broken. A 12.
Fig. 13. Young individual, showing character of inner and outer appendage. A 12.
Fig. 14. Spore. D 4.

Laboulbenia perpendicularis Thaxter. p. 321

Fig. 15. Mature individual, the tip of the outer appendage broken. A 12.
Fig. 16. Inner appendage with single antheridium at left. D 12.
Fig. 17. Young individual with unbroken appendages. A 12.
Fig. 18. Spore.

Laboulbenia Nebriæ Peyritsch. p. 320

Fig. 19. Mature individual. A 12.
Fig. 20. Young individual with three antheridia on inner appendage. A 12.
Fig. 21. Inner appendage with a single antheridium at the left. A 12.

Laboulbenia Casnoniæ Thaxter. p. 319

Fig. 22. Mature individual. A 12.
Fig. 23. Spore. D 4.

Laboulbenia paupercula Thaxter. p. 314

Figs. 24, 25. Two individuals in which the inner appendage occupies opposite positions in either case. A 12.
Fig. 26. Branch of inner appendage with two antheridia. D 12.
Fig. 27. Spore. D 4.

Laboulbenia cornuta Thaxter. p. 344

Fig. 28. Mature individual, the appendages broken. A 12.
Fig. 29. Young individual. A 12.
Fig. 30. Tip of perithecium, showing appendage formed by the outgrowth of one of the lip-cells. A 12.

DESCRIPTION OF PLATE XIV.

Laboulbenia compressa Thaxter. p. 327

Fig. 1. Mature individual. A 12.
Fig. 2. Spore. D 4.
Fig. 11. Portion of branch from inner appendage with two antheridia. D 12.

Laboulbenia elegans Thaxter. p. 324

Fig. 3. Mature individual. A 12.
Fig. 4. Tip of perithecium. D 4.
Fig. 5. Branch of inner appendage with two antheridia. D 12.
Fig. 6. Spore. D 4.

Laboulbenia lepida Thaxter. p. 323

Fig. 7. Mature individual. A 12.
Fig. 8. Tip of perithecium. D 4.
Fig. 9. Branch from inner appendage with three antheridia. D 12.
Fig. 10. Spore. D 4.

Laboulbenia conferta Thaxter. p. 325

Fig. 12. Mature individual. A 12.
Fig. 13. Branch of inner appendage with two antheridia. D 12.
Fig. 14. Spore. D 4.

Laboulbenia Harpali Thaxter. p. 326

Figs. 15, 16. Two mature individuals.
Fig. 17. Branch of inner appendage with single antheridium. D 12.
Fig. 18. Spore. D 4.

Laboulbenia filifera Thaxter. p. 328

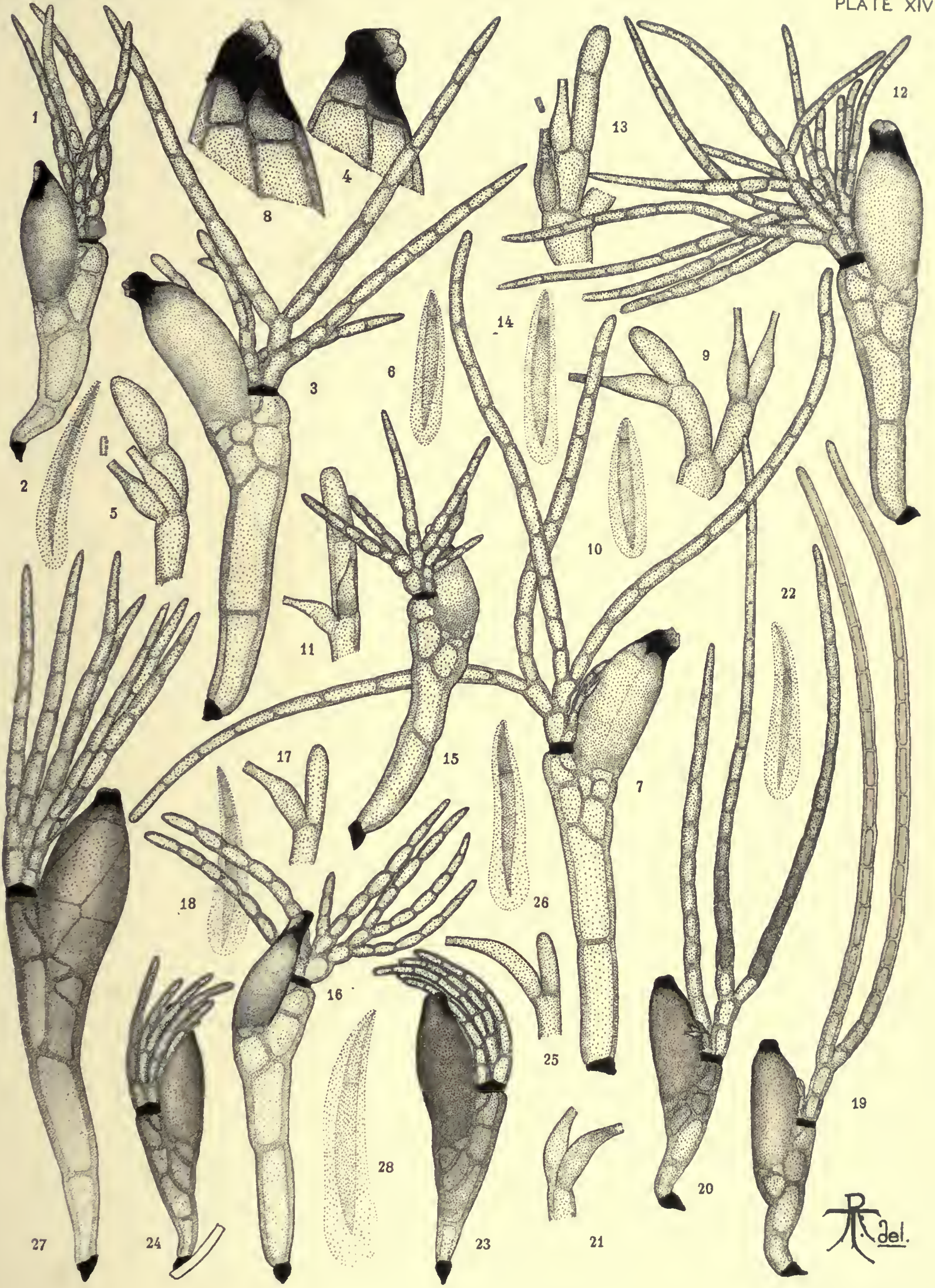
Figs. 19, 20. Mature individuals. A 12.
Fig. 21. Inner appendage with two antheridia. D 12.
Fig. 22. Spore. D 4.

Laboulbenia scelophila Thaxter. p. 329

Figs. 23, 24. Two mature individuals. A 12.
Fig. 25. Tip of branch from inner appendage with single antherozoid. D 12.
Fig. 26. Spore. D 4.

Laboulbenia recta Thaxter. p. 330

Fig. 27. Mature individual. A 12.
Fig. 28. Spore. D 4.



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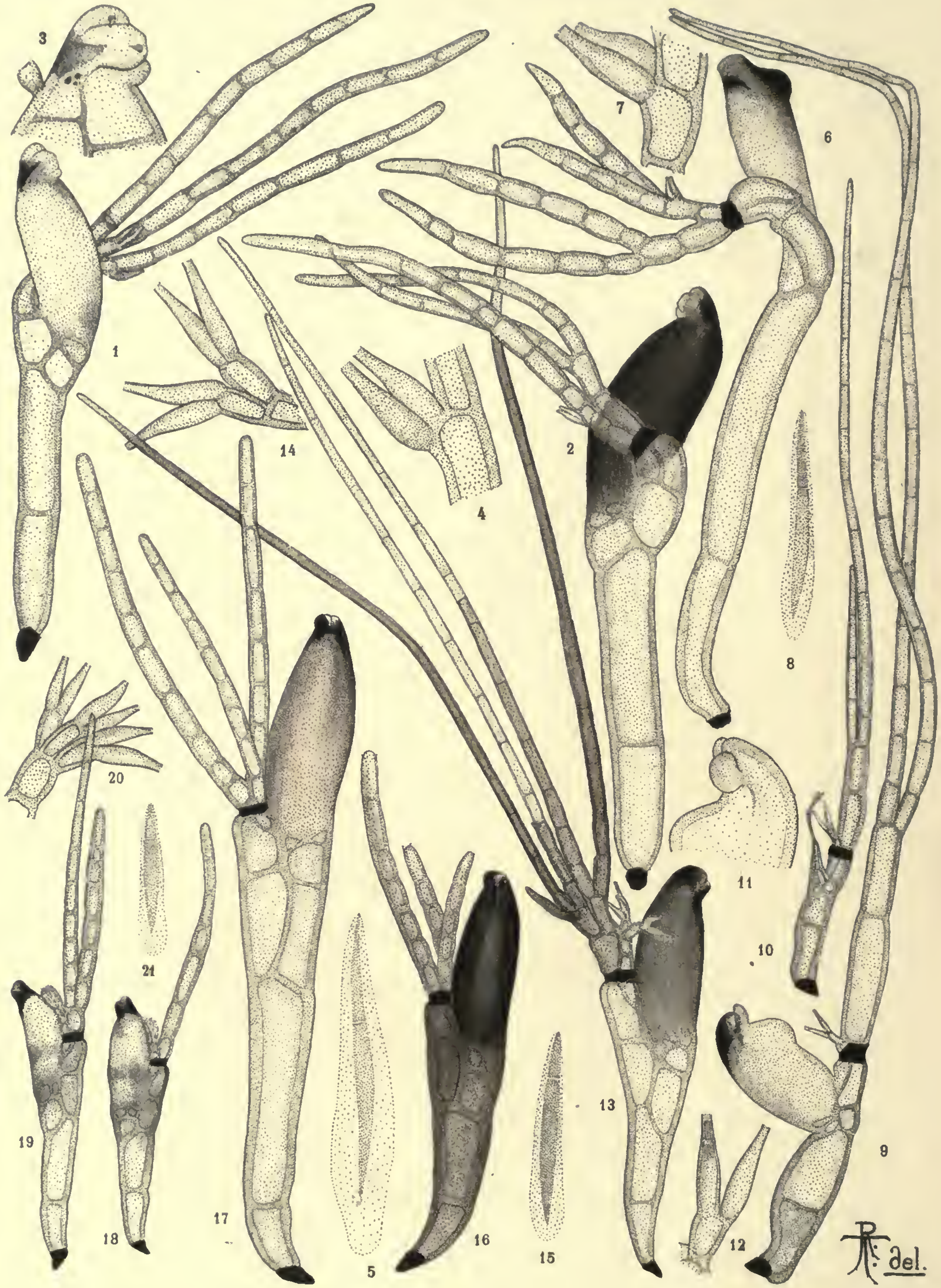
THAXTER--MONOGRAPH OF LABOULBENIACEÆ.



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THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XV.

Laboulbenia contorta Thaxter. p. 317

Figs. 1, 2. Two mature individuals. A 12.
Fig. 3. Tip of perithecium, the base of the trichogyne still adherent at the left. D 4.
Fig. 4. Portion of inner appendage with a pair of antheridia. D 12.
Fig. 5. Spore. D 4.

Laboulbenia gibberosa Thaxter. p. 317

Fig. 6. Mature individual. A 12.
Fig. 7. Portion of inner appendage with pair of antheridia. D 12.
Fig. 8. Spore. D 4.

Laboulbenia umbonata Thaxter. p. 323

Fig. 9. Mature individual. A 12.
Fig. 10. Young individual, showing antheridia and trichogyne with antherozoids *in situ*. A 12.
Fig. 11. Tip of perithecium, showing ear-like lips. D 4.
Fig. 12. Inner appendage with two antheridia. D 12.

Laboulbenia terminalis Thaxter. p. 316

Fig. 13. Mature individual. A 12.
Fig. 14. Branch of inner appendage with four antheridia. D 12.
Fig. 15. Spore. D 4.

Laboulbenia rigida Thaxter. p. 314

Figs. 16, 17. Mature individuals. A 12.

Laboulbenia polyphaga Thaxter. p. 315

Figs. 18, 19. Two mature individuals. A 12.
Fig. 20. Branch of inner appendage with six antheridia. D 12.
Fig. 21. Spore. D 4.

DESCRIPTION OF PLATE XVI.

Laboulbenia elongata Thaxter. p. 312

Figs. 1, 2. Two mature individuals. On *Platynus extensicollis*. A 12.
Fig. 3. Branch of inner appendage with antheridia. D 12.
Fig. 4. Mature individual from *Platynus cincticollis*, typical form. A 2.
Fig. 5. Spore of Fig. 4. D 4.
Fig. 6. Form on *Colpodes purpuripennis*. A 2.
Fig. 7. Spore of Fig. 6. D 4.
Fig. 8. Form on *Platynus floridanus*. A 2.
Fig. 9. Younger individual (see fig. 4) on *Platynus cincticollis*. A 2.
Fig. 10. Form on elytra of *Platynus cincticollis*. A 2.
Fig. 11. Form on *Platynus extensicollis*. A 2.
Fig. 12. Form on *Colpodes duplex*. A 2.
Fig. 13. Form on *Platynus dissectus*. A 2.
Fig. 14. Form from legs of *Platynus cincticollis*. A 2.

Laboulbenia europœa Thaxter. p. 311

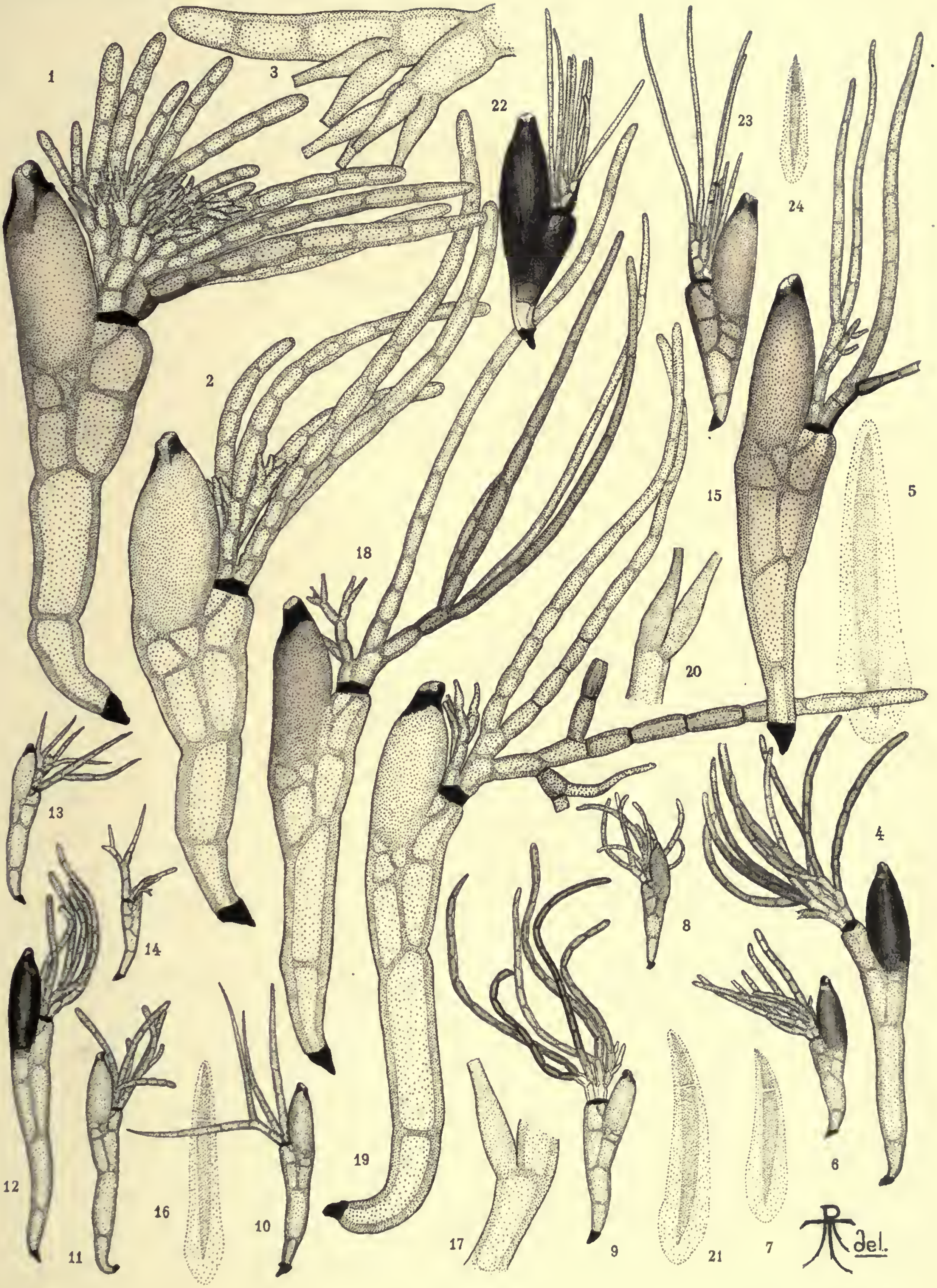
Fig. 15. Mature individual from *Chlœnius œneocephalus*. A 12.
Fig. 16. Spore. D 4.
Fig. 17. Part of inner appendage with antheridium. D 12.

Laboulbenia Pterostichi Thaxter. p. 315

Figs. 18, 19. Two mature individuals. A 12.
Fig. 20. Branch of inner appendage with two antheridia. D 12.
Fig. 21. Spore. D 4.

Laboulbenia parvula Thaxter. p. 329

Figs. 22, 23. Two mature individuals. A 12.
Fig. 24. Spore. D 4.



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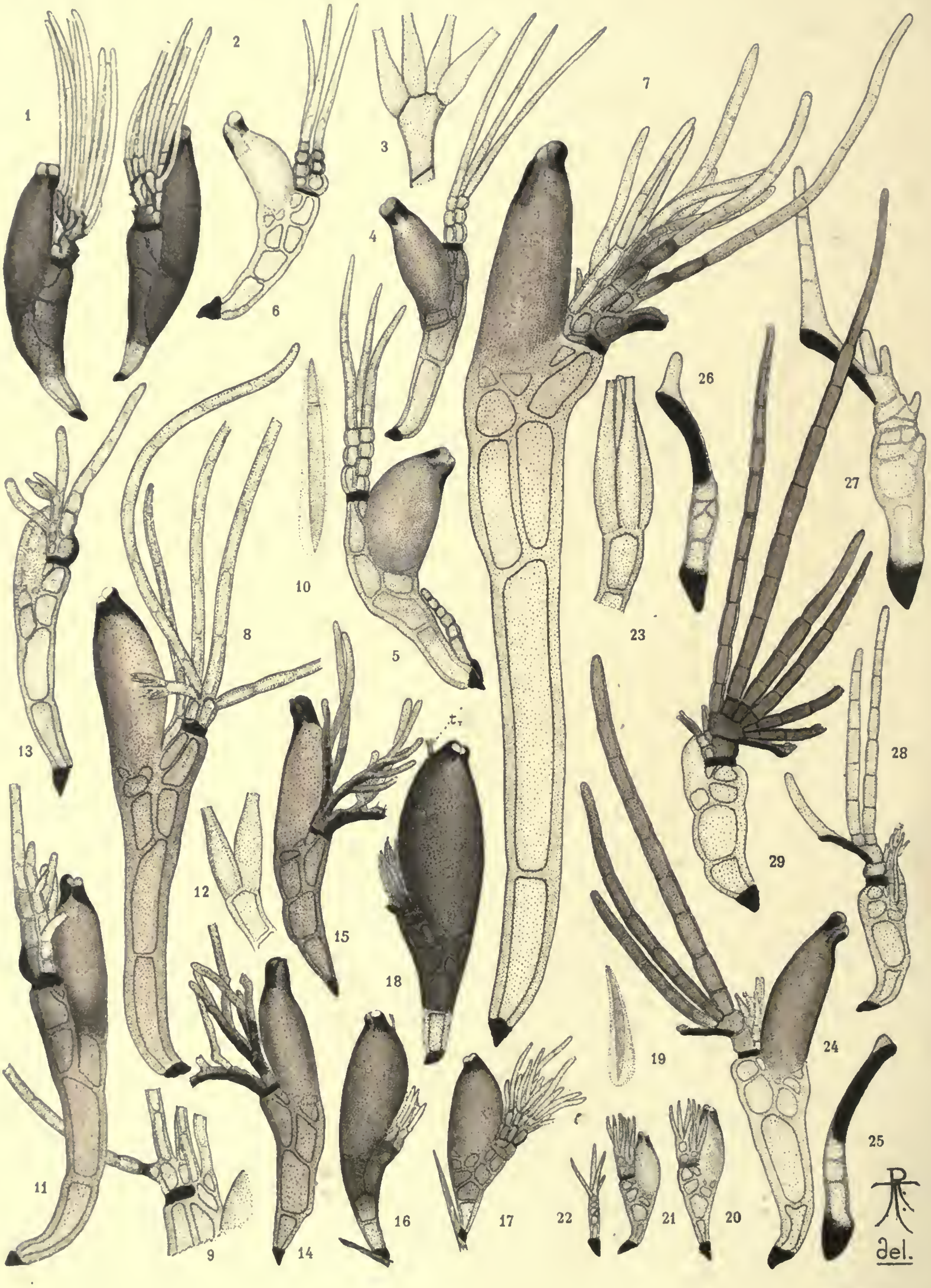
Thaxter--Monograph of Laboulbeniaceæ.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XVII.

Laboulbenia zanzibarina Thaxter. p. 332

Figs. 1, 2. Two mature individuals. A 12.
Fig. 3. Branch of fertile appendage with four antheridia. D 12.

Laboulbenia inflata Thaxter. p. 327

Figs. 4–6. Three mature individuals. Fig. 6 shows aborted member of same spore pair at the left. A 12.

Laboulbenia Quedii Thaxter. p. 347

Fig. 7. Mature individual. A 12.

Laboulbenia proliferans Thaxter. p. 348

Fig. 8. Mature individual on *Eudema tropicum*. A 12.
Fig. 9. Structure at base of appendages. On *Chlœnius auricollis*.
Fig. 10. Spore. D 4. Fig. 23. Groups of antheridia on fertile branch. D 12.

Laboulbenia Catoscopi Thaxter. p. 322

Fig. 11. Mature individual. A 12.
Fig. 12. Branch with antheridia. D 12.
Fig. 13. Young individual. A 12.

Laboulbenia Coptoderæ Thaxter. p. 340

Figs. 14, 15. Two mature individuals. A 12.

Laboulbenia curtipes Thaxter. p. 344

Figs. 16–18. Three mature individuals; the base of the old trichogyne persists below the apex in 16 and 18. A 12.
Fig. 19. Spore. D 4.

Laboulbenia Hageni Thaxter. p. 328

Figs. 20, 21. Two mature individuals. A 12.
Fig. 22. Young individual. A 12.

Laboulbenia cristata Thaxter (See also Plate II.) p. 330

Fig. 23. Mature individual. A 12.
Figs. 25–27. Three young individuals, showing successive stages. D 4.
Figs. 28, 29. Two more advanced conditions. A 12.

DESCRIPTION OF PLATE XVIII.

Laboulbenia arcuata Thaxter. p. 326

Figs. 1, 2. Two mature individuals. A 12.
Fig. 3. Part of fertile branch with antheridium. D 12.
Fig. 4. Spore pair. D 4.

Laboulbenia macrotheca Thaxter. p. 325

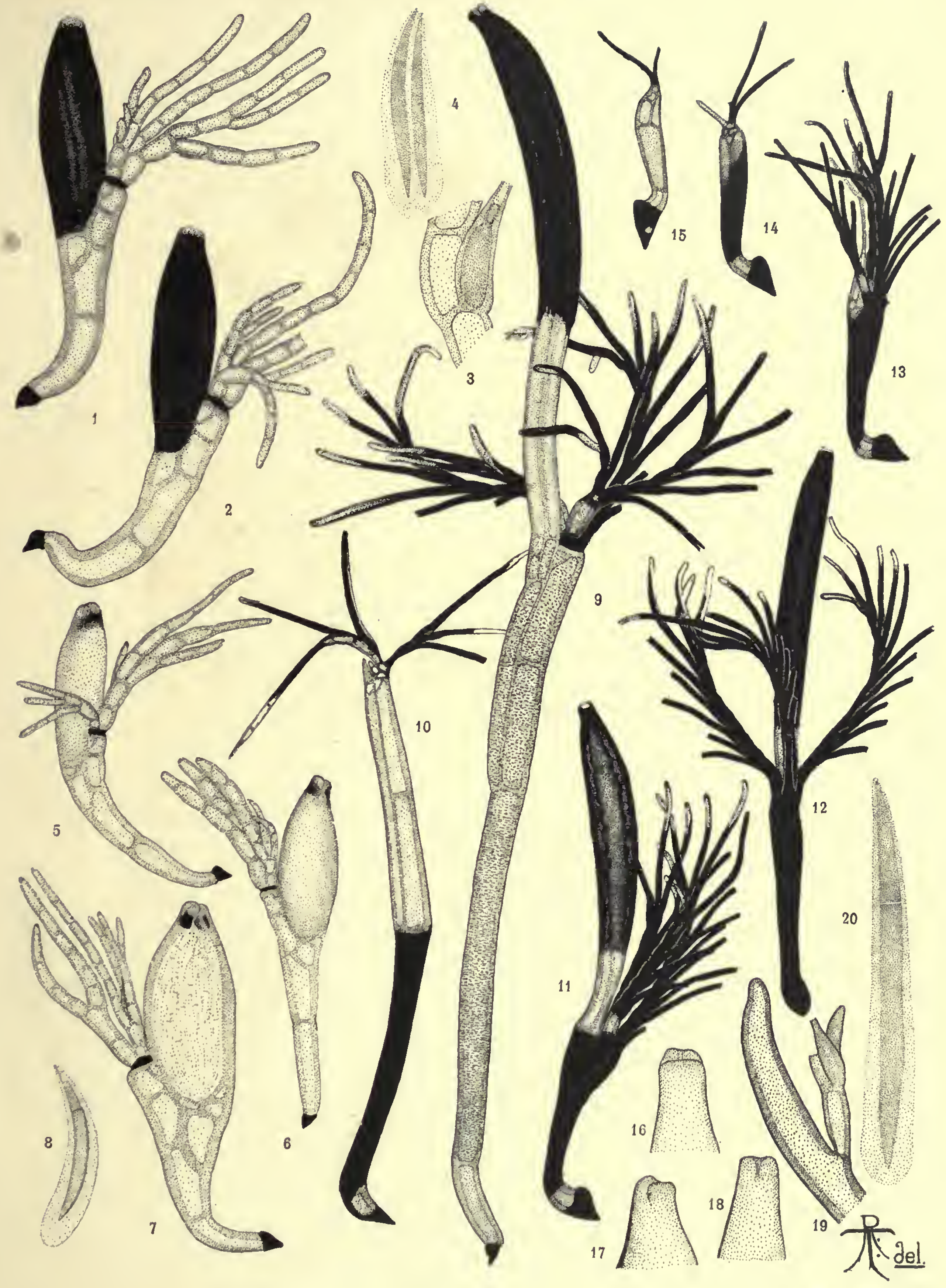
Figs. 5–7. Mature individuals. Fig. 6 the typical form. A 12.
Fig. 8. Spore. D 4.

Laboulbenia Kunkeli (Giard). p. 336

Fig. 9. Mature individual. A 2.
Fig. 10. Young individual. A 2.

Laboulbenia palmella Thaxter. p. 337

Figs. 11, 12. Two mature individuals, lateral and posterior views. A 2.
Fig. 13. Young individual with trichogyne. A 2.
Figs. 14, 15. Two young individuals. A 2.
Figs. 16–18. Anterior lateral and posterior views of tip of perithecium. D 2.
Fig. 19. Tip of branch of inner appendage bearing branch with antheridia. D 12.
Fig. 20. Spore. D 4.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

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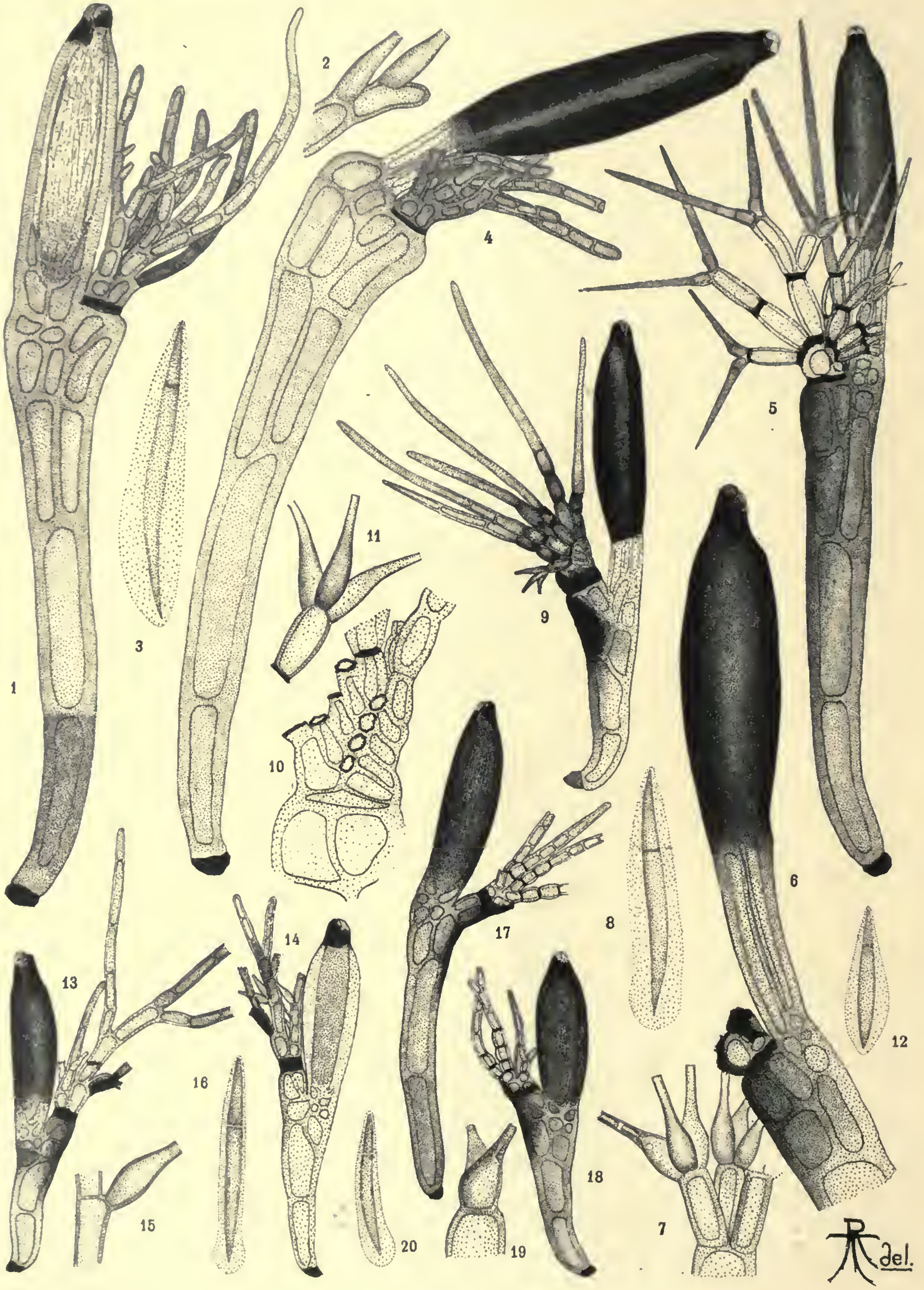
PLATE XIX.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XIX.

Laboulbenia mexicana Thaxter. p. 334

Fig. 1. Mature individual. A 12.
Fig. 2. Branch with antheridia. D 12.
Fig. 3. Spore. D 4.

Laboulbenia melanotheca Thaxter. p. 335

Fig. 4. Mature individual. A 12.

Laboulbenia longicollis Thaxter. p. 335

Fig. 5. Mature individual. A 12.
Fig. 6. Mature individual: terminal portion, the branches all broken from the basal cells of the appendages. A 12.
Fig. 7. Branches of inner appendage with groups of antheridia. D 12.
Fig. 8. Spore.

Laboulbenia Galeritæ Thaxter. p. 333

Fig. 9. Mature individual. A 12.
Fig. 10. Lateral view of base of appendages, showing insertion of branches.
Fig. 11. Fertile branch of inner appendage with three antheridia D 12.
Fig. 12. Spore. D 4.

Laboulbenia australiensis Thaxter. p. 339

Fig. 13. Mature individual. A 12.
Fig. 14. Younger individual, showing thick perithecial wall. A 12.
Fig. 15. Antheridium. D 12.
Fig. 16. Spore. D 4.

Laboulbenia Panagæi Thaxter. p. 339

Figs. 17, 18. Two mature individuals. A 12.
Fig. 19. Two antheridia. D 12.
Fig. 20. Spore. D 4.

DESCRIPTION OF PLATE XX.

Laboulbenia Brachini Thaxter. p. 331

Fig. 1. Short form with appendages well developed. A 12.
Fig. 2. Elongate form with exceptionally simple appendages. A 12.
Figs. 3, 4. Young individuals. D 2.
Figs. 5, 6. Young individuals. D 4.
Fig. 7. Fertile branch with characteristic group of antheridia. D 12.
Fig. 8. Spore. D 4.

Laboulbenia Pachytelis Thaxter. p. 341

Fig. 9. Mature individual with abnormal septa in cells I and II. A 12.
Fig. 10. Mature individual, shorter form. A 12.
Fig. 11. Fertile appendage with two antheridia. D 12.
Fig. 12. Spore pair. D 4.

Laboulbenia Pheropsophi Thaxter. p. 338

Fig. 13. Mature individual. A 12.
Fig. 14. Antheridium. D 12.
Fig. 15. Spore pair.

Laboulbenia texana Thaxter. p. 340

Fig. 16. Mature individual. A 12.
Fig. 17. Young individual. A 12.
Fig. 18. Antheridium. D 12.

Laboulbenia decipiens Thaxter. p. 334

Fig. 19. Mature individual. A 12.
Fig. 20. Antheridium. D 12.
Fig. 21. Spore. D 4.

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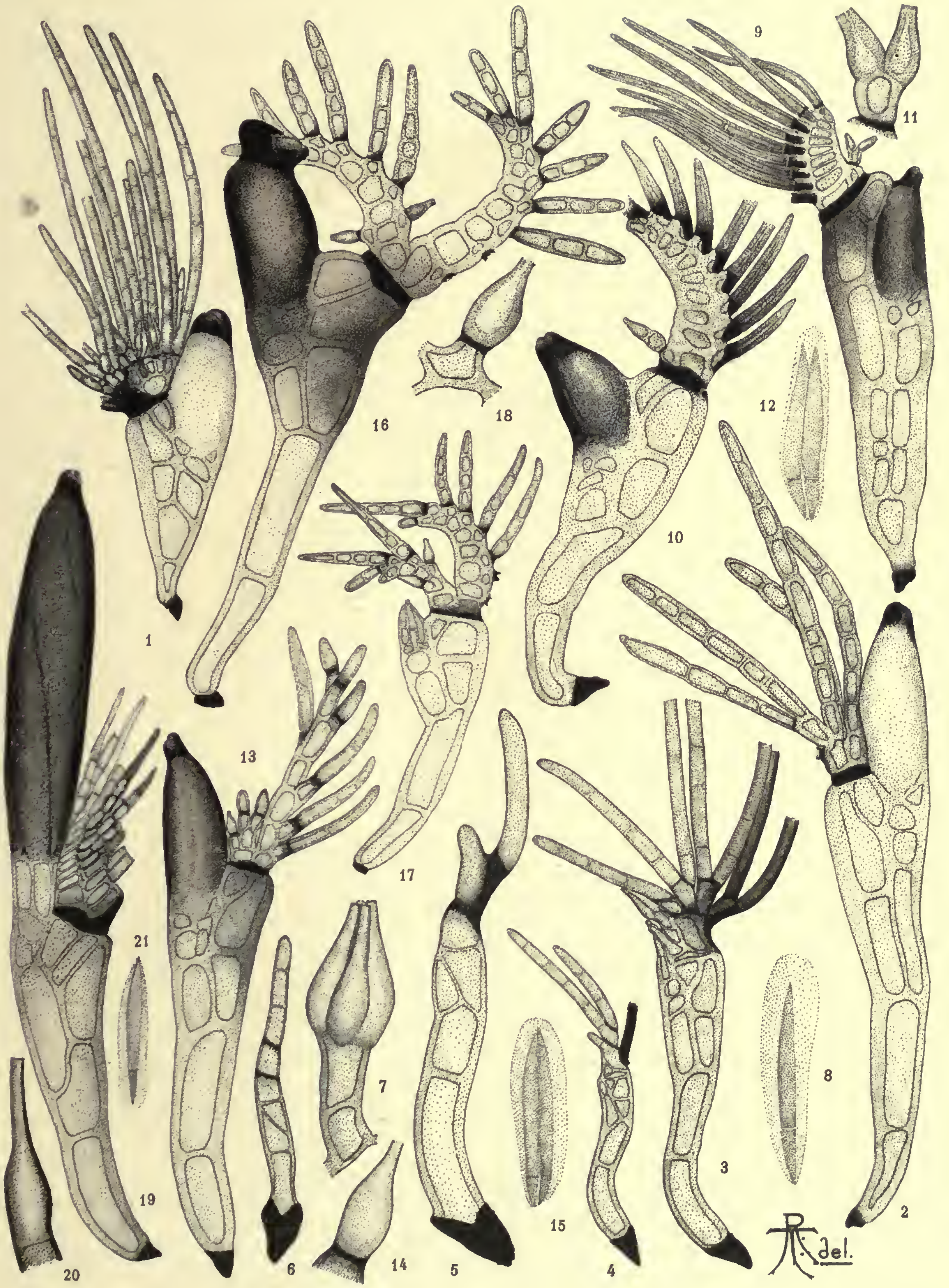
PLATE XX



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THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XX.

Laboulbenia Brachini Thaxter. p. 331

Fig. 1. Short form with appendages well developed. A 12.
Fig. 2. Elongate form with exceptionally simple appendages. A 12.
Figs. 3, 4. Young individuals. D 2.
Figs. 5, 6. Young individuals. D 4.
Fig. 7. Fertile branch with characteristic group of antheridia. D 12.
Fig. 8. Spore. D 4.

Laboulbenia Pachytelis Thaxter. p. 341

Fig. 9. Mature individual with abnormal septa in cells I and II. A 12.
Fig. 10. Mature individual, shorter form. A 12.
Fig. 11. Fertile appendage with two antheridia. D 12.
Fig. 12. Spore pair. D 4.

Laboulbenia Pheropsophi Thaxter. p. 338

Fig. 13. Mature individual. A 12.
Fig. 14. Antheridium. D 12.
Fig. 15. Spore pair.

Laboulbenia texana Thaxter. p. 340

Fig. 16. Mature individual. A 12.
Fig. 17. Young individual. A 12.
Fig. 18. Antheridium. D 12.

Laboulbenia decipiens Thaxter. p. 334

Fig. 19. Mature individual. A 12.
Fig. 20. Antheridium. D 12.
Fig. 21. Spore. D 4.

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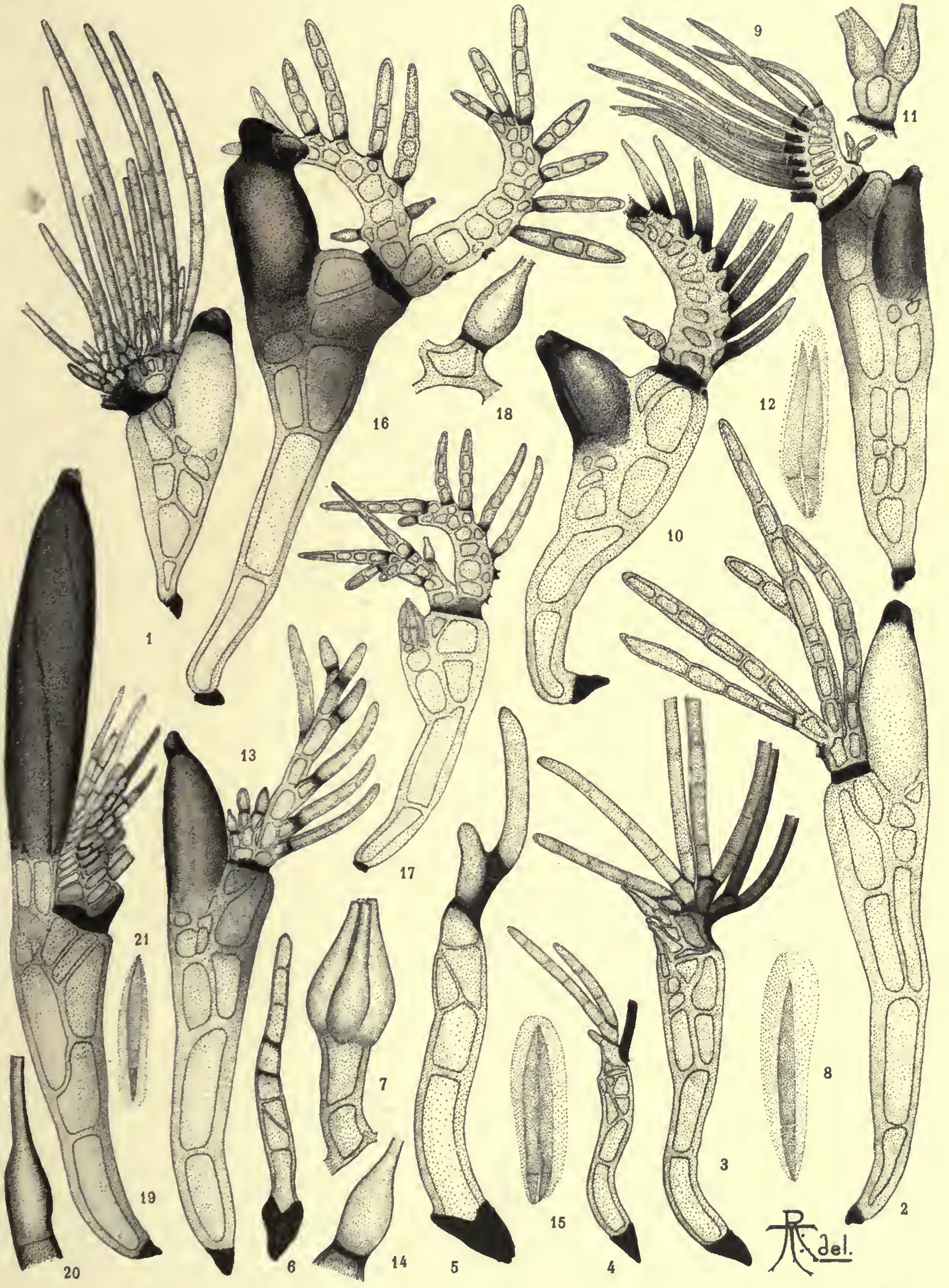

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THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

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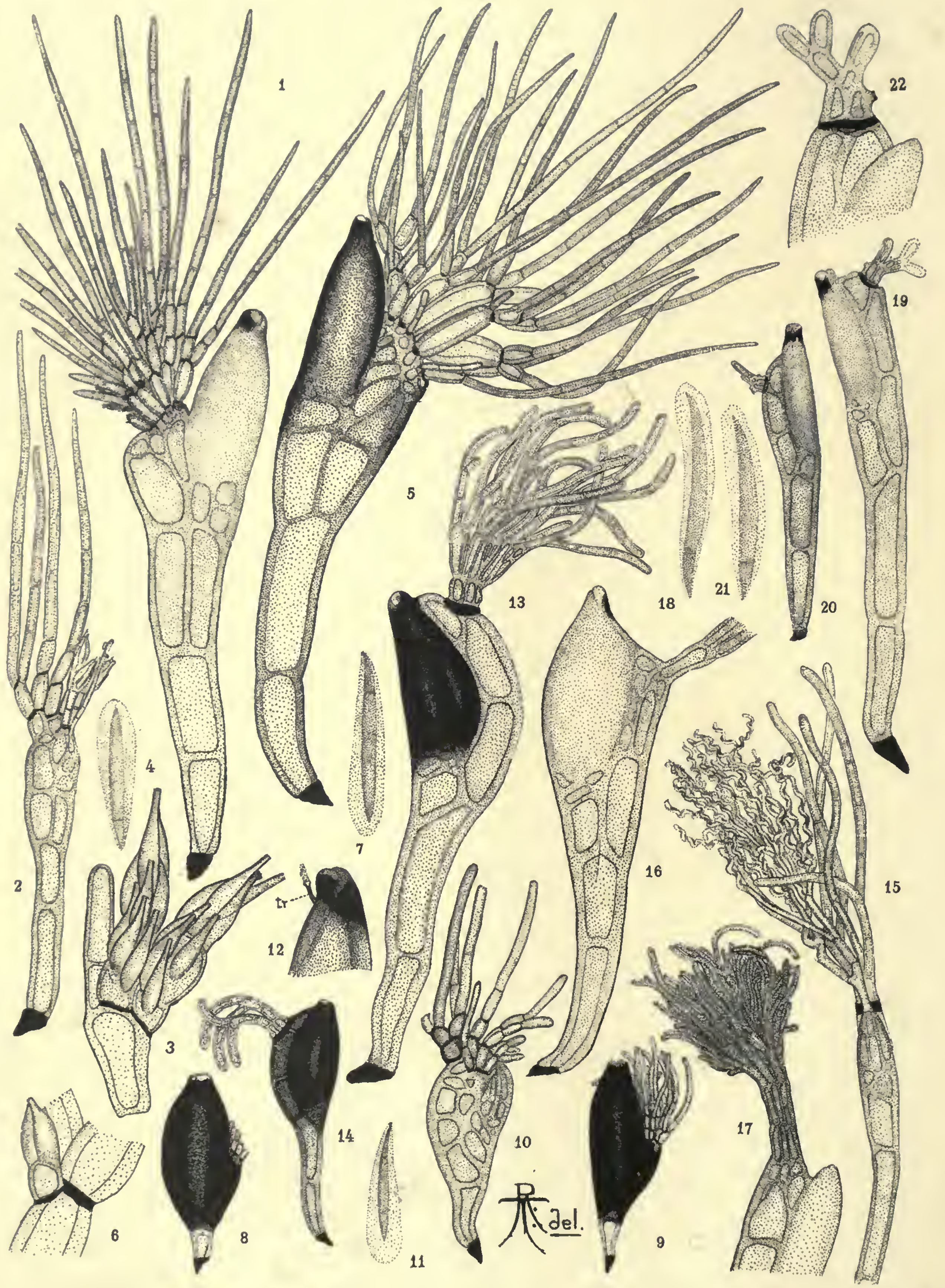

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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XXI.

Laboulbenia variabilis Thaxter. p. 351

Fig. 1. Mature individual. A 12.
Fig. 2. Young individual, trichogyne with antherozoids *in situ*. D 2.
Fig. 3. Fertile branch with groups of antheridia. D 12.
Fig. 4. Spore. D 4.
Fig. 12. Tip of perithecium, the base of old trichogyne at the left. D 4.

Laboulbenia brachiata Thaxter. p. 349

Fig. 5. Mature individual. A 12.
Fig. 6. Part of fertile branch with antheridia. D 12.
Fig. 7. Spore. D 4.

Laboulbenia minima Thaxter. p. 347

Figs. 8, 9. Mature individuals. A 12.
Fig. 10. Young individual. D 4.
Fig. 11. Spore. D 4.
(Fig. 12. See *sub L. variabilis.*)

Laboulbenia Schizogenii Thaxter. p. 343

Fig. 13. Mature individual. A 12.
Fig. 14. Mature individual, small form. A 12.
Fig. 15. Young individual, anterior view, showing highly developed trichogyne with spirally coiled extremities.

Laboulbenia Clivinæ Thaxter. p. 342

Fig. 16. Mature individual, the branches of the appendage broken off. A 12.
Fig. 17. Tip of young individual, showing unbroken appendage. A 12.
Fig. 18. Spore. D 4.

Laboulbenia Morionis Thaxter. p. 341

Figs. 19, 20. Two mature individuals. A 12.
Fig. 21. Spore. D 4.
Fig. 22. Terminal portion of young individual, showing unbroken appendages. D 4.

DESCRIPTION OF PLATE XXII.

Laboulbenia luxurians Peyritsch. p. 346

Fig. 1. Mature individual. A 12.
Figs. 2–7. Young individuals, showing successive stages of development. D 2.
Fig. 8. Spore. D 10.

Laboulbenia fumosa Thaxter. p. 345

Figs. 9–17. Successive stages of development from germinating spore. D 2.
Fig. 18. Mature individual. A 12.
Fig. 19. Antheridium. D 12.
Fig. 20. Spore. D 4.

Laboulbenia confusa Thaxter. p. 346

Fig. 21. Mature individual. A 12.
Fig. 22. Young individual with unbroken appendages. A 12.

Laboulbenia compacta Thaxter. p. 346

Fig. 23. Mature individual. A 12.
Fig. 24. Young individual. D 2.
Fig. 25. Spore. D 4.

Laboulbenia Philonthi Thaxter. p. 343

Fig. 26. Mature individual. A 12.
Fig. 27. Young individual, showing divisions of basal cell of inner appendage. A 12.
Fig. 28. Young individual with peculiarly modified basal cell. D 2.
Fig. 29. Tip of perithecium with trichogyne. D 4.
Fig. 30. Spore. D 4.

Laboulbenia Gyrinidarum Thaxter. p. 353

Fig. 31. Mature individual. A 12.

Figs. 32–34. Young individuals, showing cell-structure at base of appendages. One of the characteristic branches is just beginning to develop at the right in Fig. 34. D 2.

Fig. 35. Spore. D 4.
Fig. 36. Trichogyne. D 2.
Fig. 37. Tip of perithecium enlarged.

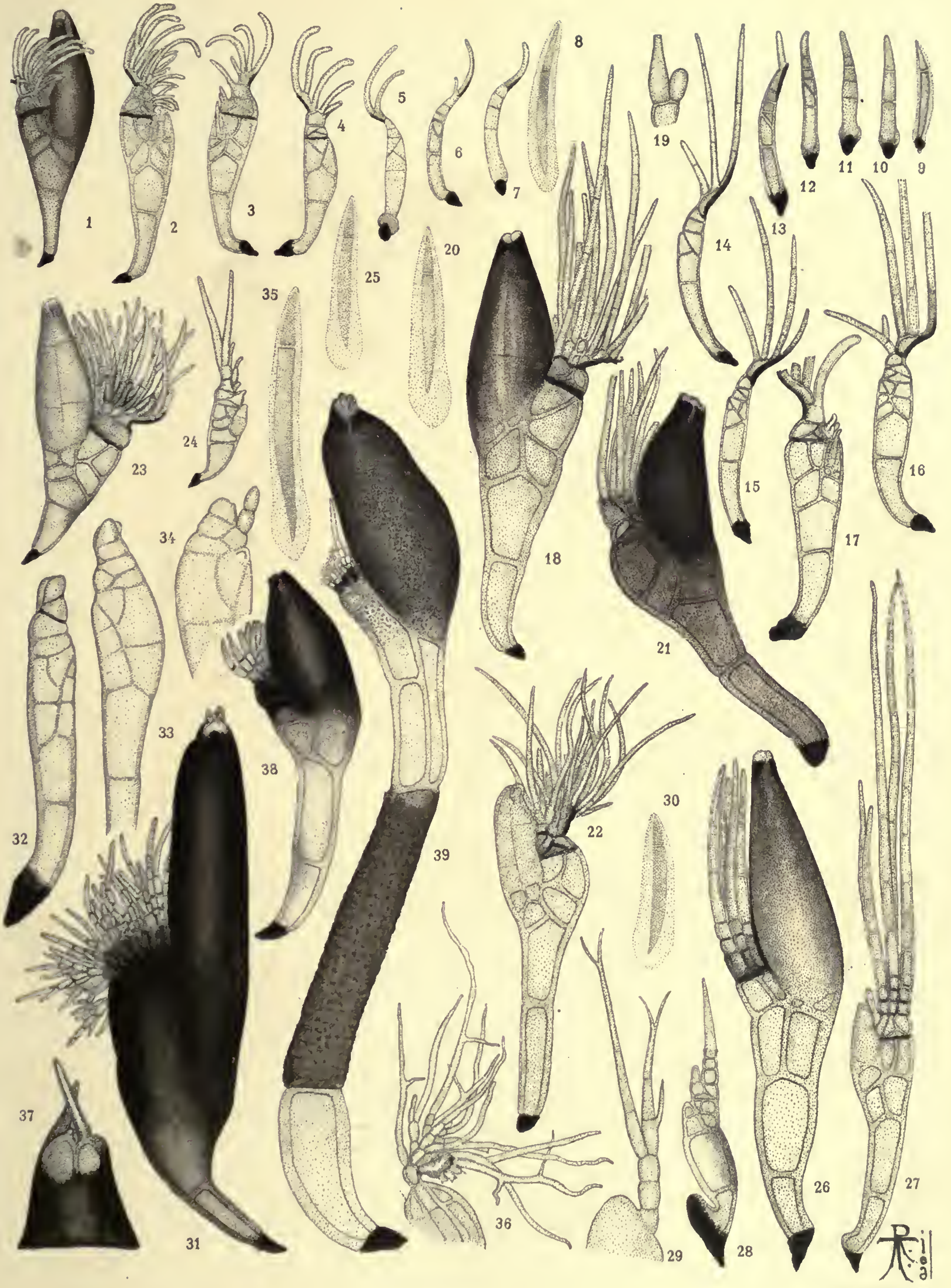
Laboulbenia Guerinii Robin. p. 353

Fig. 38. Mature individual. A 12.

Laboulbenia Oberthuri Giard. p. 352

Fig. 39. Mature individual. A 4.

PLATE XXII.



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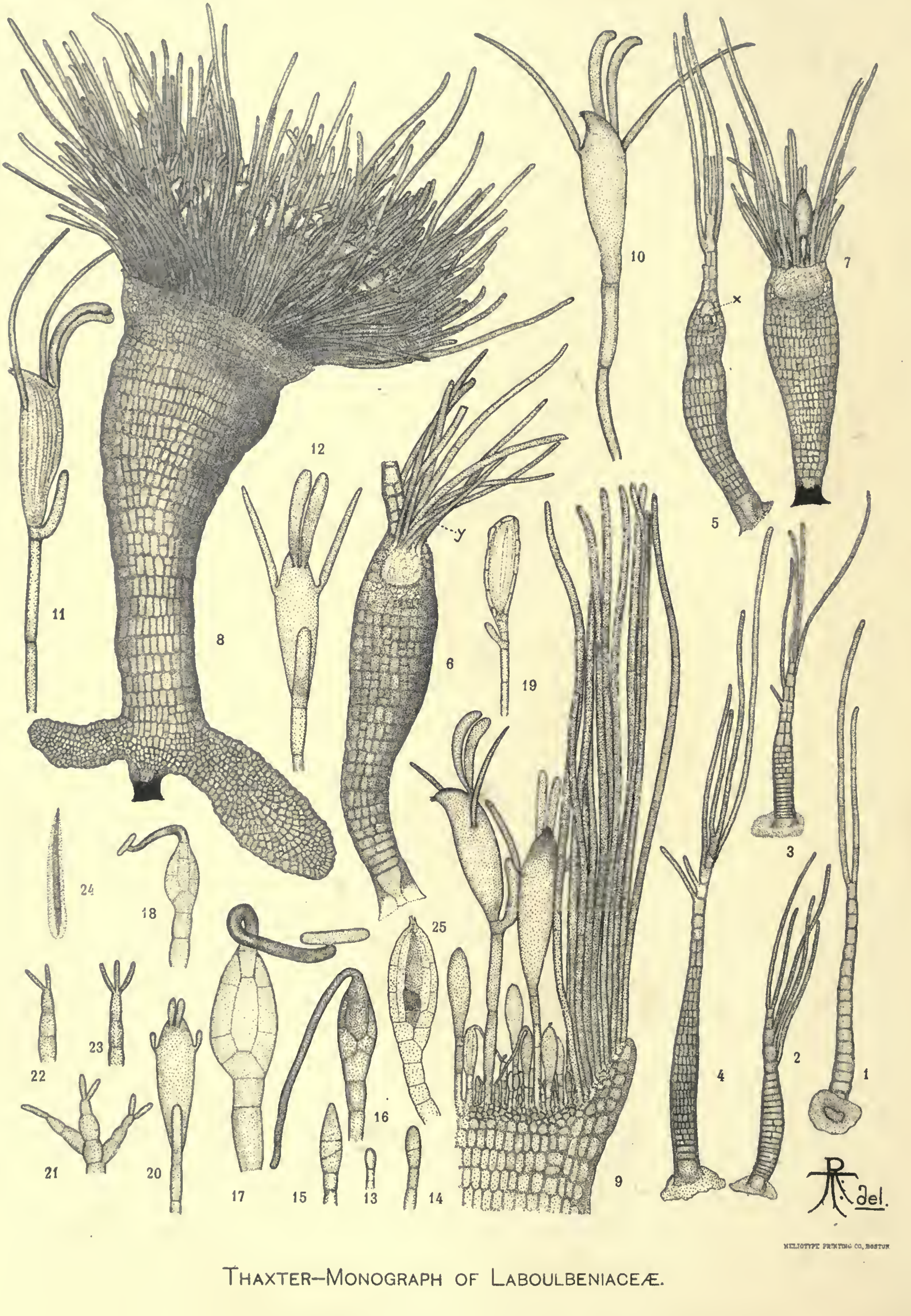

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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XXIII.

Zodiomyces vorticellarius Thaxter. p. 371

Figs. 1–4. Young individuals in various stages of development. D 2.

Fig. 5. Young individual. A cavity is forming above the perithecigerous cells. D 2.

Fig. 6. Young individual, the upper portion of the receptacle seen in optical section. The end of the primary appendage at the left has been broken off. The secondary appendages have burst through the superficial cells at the apex of the receptacle, and the perithecia are beginning to arise from the perithecigerous cells at the base of the cup-like cavity. D 2.

Fig. 7. More mature individual, the optical section of its cup-like extremity indicated in part. The primary appendage has disappeared, and one perithecium is nearly mature. A 12.

Fig. 8. Mature individual. A 12.

Fig. 9. Section of portion of extremity showing cup-like form, the secondary appendages on the right arising from the inner surface of its rim distinct from the central fertile cells, from which arise antheridia and perithecia in various stages of development. Drawn and partly reconstructed from a microtome section. D 4.

Figs. 10–12. Anterior, lateral, and posterior views of mature perithecia. D 4.

Figs. 13–15. Very young perithecia, showing origin as terminal cell (fig. 13), and two further divisions of this cell. J 4.

Fig. 16. Young perithecium. J 4.

Fig. 17. Young perithecium with trichogyne and conjugating antherozoid. Leitz oil $\frac{1}{12}+12$.

Fig. 18. A similar stage. D 12.

Fig. 19. Young perithecium before development of its appendages, lateral view. D 4.

Fig. 20. Young perithecium: its appendages beginning to bud out, posterior view. D 4.

Figs. 21–23. Antheridial branches, bearing exogenous antherozoids. D 12.

Fig. 24. Spore. D 4.

Fig. 25. Young perithecium in which the ascogenic cell has divided, the trichogyne having withered and broken off. J 4.

DESCRIPTION OF PLATE XXIV.

Ceratomyces mirabilis Thaxter. p. 374

Fig. 1. Mature individual, showing spores and asci within the perithecium. A 12.

Fig. 2. Younger individual, surface view. A 12.

Fig. 3. Young individual. A 12.

Fig. 4. The same, enlarged to show the cell-structure at the base of the appendage. The young trichogyne is developing at the right. D 12.

Fig. 5. Young individual, the branched trichogyne arising between the base of the appendage and the developing perithecium. A 12.

Fig. 6. Individual younger than the last with simple trichogyne, and two conjugating antherozoids (?). A 12.

Fig. 7. The same, showing the base of the trichogyne and its cell-connections. The perithecium just beginning to develop at the left. Compare the younger condition seen in fig. 4. D 12.

Fig. 8. Growing tip of perithecium, showing cell-arrangement (cc) canal-cells, (wc) wall-cells. D 4.

Fig. 9. Ascus with ascospores. D 4.

Fig. 10. Ascospore. D 4.

Ceratomyces confusus Thaxter. p. 375

Figs. 11, 12. Two mature individuals. A 12.

Ceratomyces camptosporus Thaxter. p. 376

Fig. 13. Pair of ascospores. D 4.

Fig. 14. Mature individual. A 12.

Ceratomyces filiformis Thaxter. p. 376

Figs. 15, 16. Two mature individuals. A 12.

Fig. 17. Ascospore. D 4.

Ceratomyces rostratus Thaxter. p. 378

Fig. 18. Mature individual fully developed. A 12.

Fig. 19. Ascus with immature ascospores. D 4.

Figs. 20–23. Young individuals in various stages of development, Figs. 23, 24 showing exogenous antherozoids. A 12.

Fig. 24. Portion of fertile branch, showing antherozoids. D 12.

Fig. 25. Ascospore. D 4.

Ceratomyces rostratus var. p. 378

Fig. 26. Mature individual. A 12.

Fig. 27. Ascospore. D 4.

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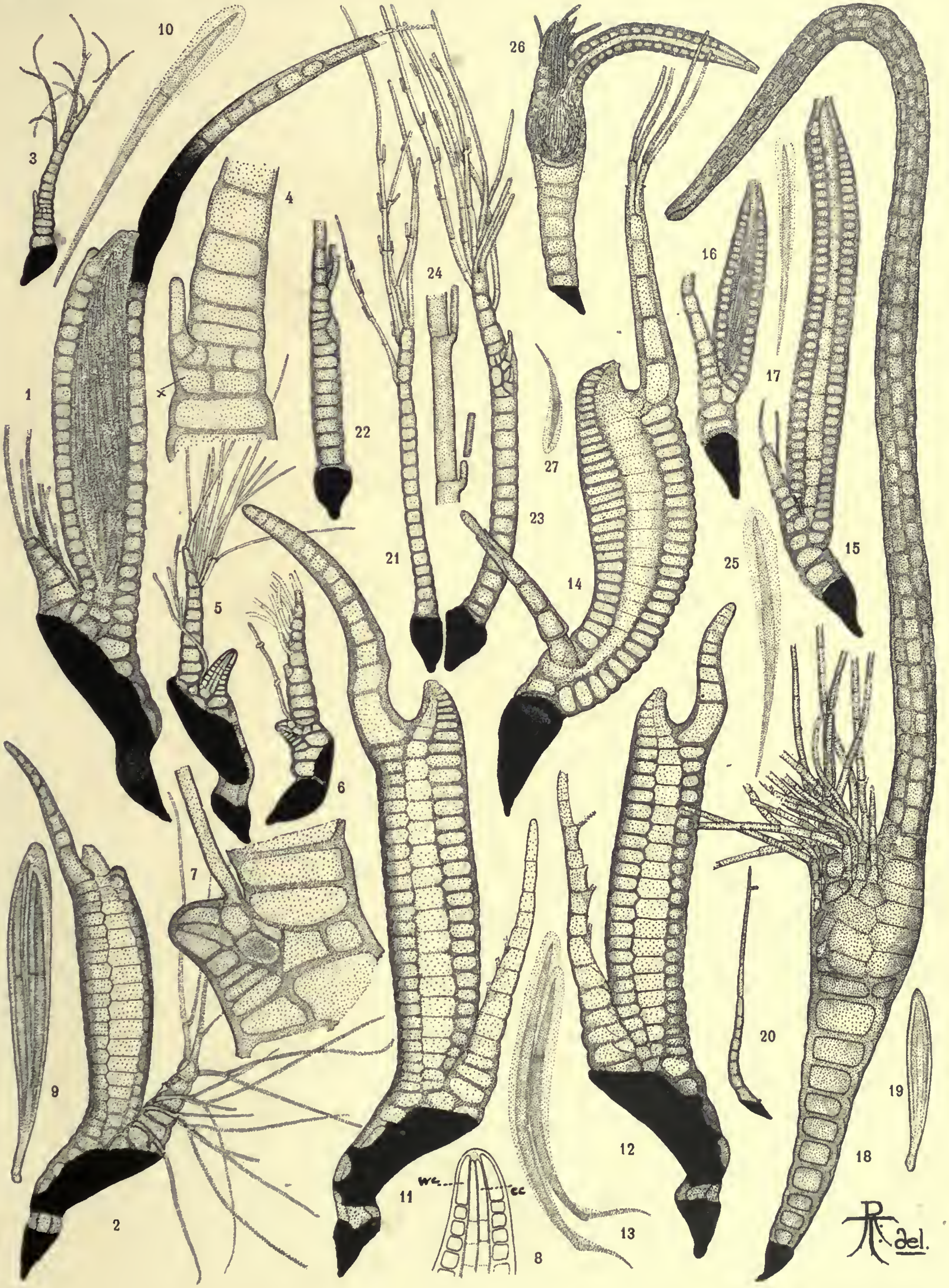

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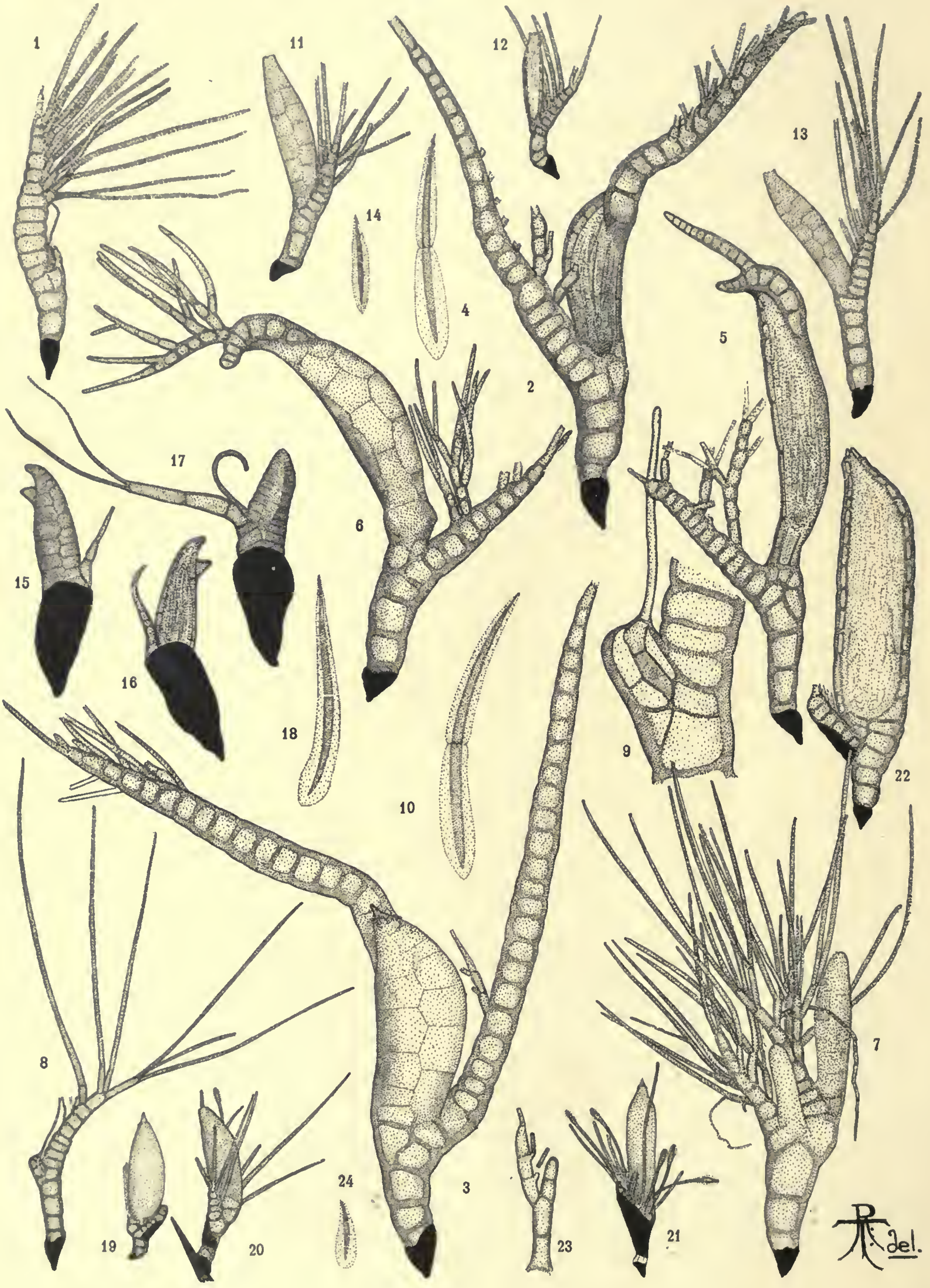
THAXTER--MONOGRAPH OF LABOULBENIACEÆ.

PLATE XXV.



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THAXTER—MONOGRAPH OF LABOULBENIACEÆ.

DESCRIPTION OF PLATE XXV.

Ceratomyces furcatus Thaxter. p. 379

Fig. 1. Young individual with trichogyne. A 12.
Fig. 2. Mature individual, the perithecium in optical section. A 12.
Fig. 3. Mature individual, surface view. A 12.
Fig. 4. Ascospore. D 4.

Ceratomyces contortus Thaxter. p. 379

Fig. 5. Mature individual, the perithecium seen in optical section. A 12.
Fig. 6. Mature individual, surface view. A 12.
Fig. 7. Abnormal individual, producing two perithecia. A 12.
Fig. 8. Young individual with trichogyne. A 12.
Fig. 9. The same, showing cell-connections of trichogyne. D 12.
Fig. 10. Spore. D 4.

Ceratomyces humilis Thaxter. p. 380

Figs. 11–13. Mature individuals. A 12.
Fig. 14. Spore. D 4.

Ceratomyces minisculus Thaxter. p. 377

Figs. 15, 16. Mature individuals. A 12.
Fig. 17. Younger individual with old trichogyne. A 12.
Fig. 18. Spore. D 4.

Ceratomyces terrestris Thaxter. p. 377

Figs. 19–21. Mature individuals, showing various degrees of blackening in the receptacle. A 12.
Fig. 22. A mature individual, enlarged sectional view. D 4.
Fig. 23. Appendage bearing antheridia. D 12.
Fig. 24. Spore. D 4.

DESCRIPTION OF PLATE XXVI. See also Plate VI.

Chitonomyces simplex Thaxter. p. 292

Figs. 1, 2. Two mature individuals. D 2.
Fig. 3. Spore. D 4.

Chitonomyces Bidessarius Thaxter. p. 292

Figs. 4, 5. Two mature individuals. D 2.

Chitonomyces aurantiacus Thaxter. p. 293

Figs. 6, 7. Two mature individuals. D 2.

Chitonomyces borealis Thaxter. p. 292

Figs. 8, 9. Two mature individuals. D 2.

Chitonomyces hyalinus Thaxter. p. 291

Figs. 10, 11. Two mature individuals. D 2.

Chitonomyces affinis Thaxter. p. 291

Figs. 12, 13. Two mature individuals. D 2.
Fig. 14. Spore. D 4.

Chitonomyces lichanophorus Thaxter. p. 290

Fig. 15. Mature individual. D 2.
Fig. 16. Spore. D 4.

Chitonomyces rhyncostoma Thaxter. p. 290

Figs. 17, 18. Two mature individuals. D 2.

Chitonomyces melanurus Peyritsch. p. 289

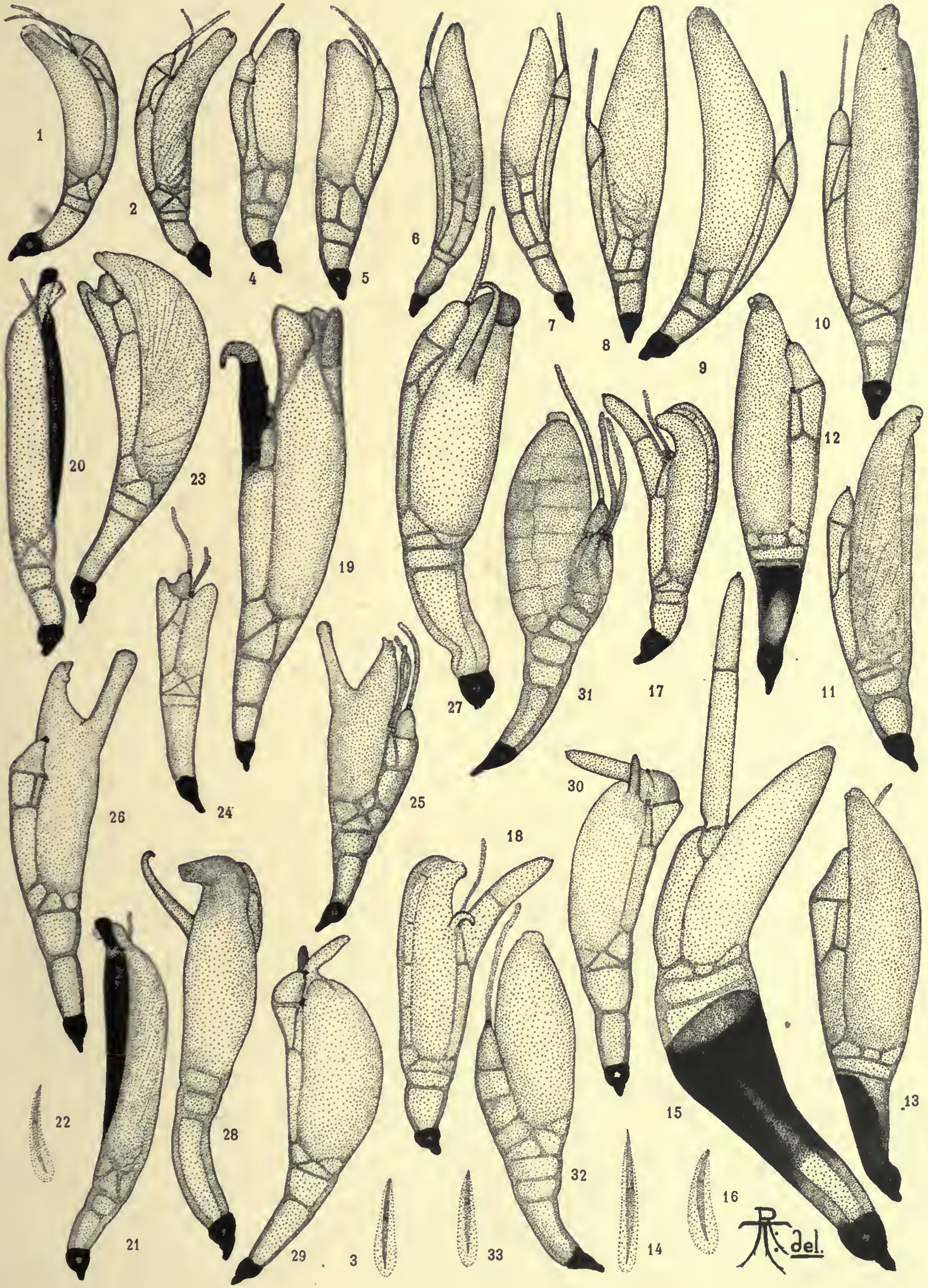
Fig. 19. Mature individual. The insertion of the appendage projects as a papilla from the inner margin of the blackened portion. D 2.

Chitonomyces marginatus Thaxter. p. 289

Figs. 20, 21. Two mature individuals. D 2.
Fig. 22. Spore. D 4.

Chitonomyces uncinatus Thaxter p. 291

Fig. 23. Mature individual D.
Fig. 24. Young individual. D 2.



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Chitonomyces appendiculatus Thaxter. p. 287

Figs. 25, 26. Two mature individuals. D 2.

Chitonomyces uncigerus Thaxter. p. 288

Figs. 27, 28. Two mature individuals. D 2.

Chitonomyces distortus Thaxter. p. 287

Figs. 29, 30. Two mature individuals. D 2.

Hydræomyces Halipli Thaxter. p. 294

Figs. 31, 32. Two mature individuals. D 2.
Fig. 33. Spore. D 4.

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VI.

CONTRIBUTION TOWARD
A MONOGRAPH OF THE LABOULBENIACEÆ.

PART II.

BY

ROLAND THAXTER.

WITH FORTY-FOUR PLATES.

Presented April 8, 1908. Received April 6, 1908.

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19.11.48

CONTRIBUTION TOWARD
A MONOGRAPH OF THE LABOULBENIACEÆ. PART II.[1]

More than ten years have elapsed since the publication in these Memoirs of the writer's first "Contribution toward a Monograph of the Laboulbeniaceæ"[2] and during this period material of the family has accumulated so rapidly and so many novelties have been discovered, that he has been tempted to defer from year to year the publication of an illustrated account of the many new species enumerated in the six preliminary papers that have appeared in the Proceedings of the Academy between 1899 and 1905. An adequate treatment in a single paper of this mass of material has thus become impracticable; and in order to set some limit to the plates it has been necessary in general to illustrate the species by single figures, or at most two figures of adults, without attempting, except in a few instances, adequately to represent the development, or the variations of the forms considered. In many cases one, or even more plates might well have been devoted to the development and variation of a single species, especially in the genus *Laboulbenia.* Every effort has been made, however, to give accurate figures, and it is hoped that they may, in connection with the diagnoses, render the determination of the species comparatively easy. Although it has seemed undesirable to cut the diagnoses, which have all been revised and in many cases rewritten, it has been necessary, in order to reduce as far as possible the expense of publication, to make the preliminary account as brief as possible, and to omit a host index and certain other parts that might well have been included.

For the purpose of gaining a more complete knowledge of exotic forms the writer has twice visited Europe, and has examined portions of the large collections in the British Museum, the Laboratories of Entomology of the Museums of Natural History at Paris and at Berlin, the Hope Collection at Oxford and the Sharp Collection of Staphylinidæ etc., at Cambridge, now in the British Museum. Certain forms have also been obtained from the Museum of Natural History at Florence, and the National Museum at Washington. Material is also due to the courtesy of friends and correspondents who have sent insects for examination, while a considerable number of new forms have been obtained by the writer in New England and in Florida. Nearly three hundred and fifty forms are herewith illustrated, increasing to about five hundred the total number of species and varieties thus far described, which are included in more than fifty genera. Since the completion of the accompanying plates in 1905, considerably more than one hundred additional new species have already accumulated, derived from various sources; but for the most part gathered by the writer in 1905–6 during a journey in temperate South America. It is his expectation to publish figures and descriptions of these new forms with as little delay as possible, and in the meantime he will feel greatly indebted to the kindness of any correspondents who may communicate additional material. He desires in this connection to ex-press his great obligations to those who have already aided him in this manner, and to Mr. Charles Bullard in particular, who is one of the few persons that has recognized these parasites on their hosts, and to whom we owe the discovery of several of the most interesting genera and species. To Professor H. M. Richards he is indebted for a small lot of beetles from Java on which several interesting forms were found; to Prof. C. V. Piper for certain flies and beetles collected in Washington; to Dr. W. Horn of Berlin for the communication of specimens of *Tetracha* from Ecuador infested by *Laboulbenia variabilis;* to Dr. A. F. Blakeslee for a small collection of insects from Venezuela; to Dr. Dahl of the Berlin Museum for calling his attention to the occurrence of these parasites on the dipterous insects collected by him near New Guinea; to Mr. Samuel Henshaw for the determination of hosts and for many other favors; to Mr. Coquillett for his kindness in determining Diptera; to Dr. David Sharp for the privilege of examining his private collections and for many kindnesses; to Professor Poulton of Oxford and to the gentlemen in charge of the European collections above mentioned, and to the staffs of the several laboratories visited, for similar favors and courtesies. He is also greatly indebted to several other persons whose generous assistance has made the present publication possible.

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[1] This Memoir is numbered IX in the series of "Harvard Botanical Memoirs."
[2] Mem. Am. Acad. Arts and Sci., Vol. XII, No. 3, p. 195–429. Plates 1–26.

Harvard University, January, 1908.

In the first part of the present series, which the writer hopes to continue by the addition of further numbers, an account was given of the general history, literature, morphology etc. of the Laboulbeniaceæ, or Laboulbeniales, as, in conformity with modern usage, they may be conveniently designated, and to this paper reference should be made for a comprehensive review of the subject. In the present connection it is the purpose of the writer, before proceeding to a systematic consideration of the species and genera herewith illustrated, to give a brief review, only, of the literature which has appeared since 1895, and to make only such comments on the morphology, development, etc. as may seem necessary in view of the new data now available.

References to the Laboulbeniales have, within the last decade, become more frequent in the general literature of Mycology and in botanical texts, than was formerly the case, and in the numerous discussions which have appeared, dealing with the origin of the Ascomycetes and higher fungi, and the vexed question of their sexuality, one finds as a rule, at least a perfunctory reference to them. Papers, however, which advance our knowledge of them in any respect have not been very numerous, as the following list will show.

F. Cavara, Malpighia, Vol. XIII, p. 173, 1899, with plate, describes a new genus, *Rickia,* growing on ants in Europe, the single species, *R. Wassmanni,* having been subsequently distributed in Rehm, Ascomyceten No. 1451. The species is described at some length and numerous figures are given. This author, misled by the close resemblance which the general appearance of the compound antheridia of *Rickia* bear to those of the ordinary simple type, places the genus in the "Laboulbeniaceæ" as limited in the appended Key to the Genera. In discussing other general matters connected with the group, it is further suggested that these plants are not in reality parasites, but live saprophytically, that the "foot" is merely a means of attachment, and that the appendages are the true absorbing organs; an opinion to which reference will be made below.

P. Speiser, in connection with his studies of the Nycteribidæ, publishes in the Berichte d.d. Botan. Gesell., Vol. XVIII, p. 498, 1900, a note on the geographical distribution of *Helminthophana* (*Arthrorhynchus*), enumerating the species on which these fungi have been observed, and recognizing but one species in the genus. Further notes concerning this paper may be found under *Arthrorhynchus.*

C. Spegazzini in the Annales del Museo Nacional de Buenos Aires, Tomo VIII, p. 79, 1902, gives a description of a species of *Laboulbenia* which he calls *L. Argentinensis*, occurring on "*Brachinus,*" further reference to which will be found under *Laboulbenia decipiens* below.

The writer has published a note in Science, N. S. XVII, p. 463, 1903, which is a summary of a brief paper on the genus *Herpomyces* read at the meeting of the American Association for the Advancement of Science of the preceding year.

P. Baccarini, in Appendici al Nuovo Giornale Botanico Italiano, Vol. XI, p. 225, 1904, describes and figures two new forms on Gamasidæ, one, "*Rhachomyces*" *Berlesiana*, closely related to *Rickia* and *Distichomyces,* and possibly belonging to one of these genera; the other, *Laboulbenia Napoleonis.* The generic characters of these forms are not exactly determinable from the figures and descriptions given.

L. Errera in the Recueil de l'Institut botanique, Bruxelles, Tome I, p. 344, 1905, reports the presence of glycogen in the cells of *Stigmatomyces Muscæ.*

J. H. Faull in Science, N. S. XXIII, pp. 134 and 152, 1906, publishes a preliminary note on the Ascus and Spore-formation in Laboulbeniaceæ, in which he states that these processes agree in all essentials with those which occur in other typical Ascomycetes.

Lastly six preliminary descriptive papers have been published by the writer in the Proceedings of this Academy and were issued in December 1889, April 1900, March and June 1901, June 1902, and July 1905 respectively. Other contributions, if such exist, have not been brought to my attention.

It is needless to remark that so large an addition to the Laboulbeniales as is herewith presented has thrown new light on various points relating to their general morphology and development, and necessitates some modification, for example, in the conceptions of generic types, the absolute distinctions between series, etc. It has not, however, proved necessary to modify essentially the general account previously given, and in the following pages no attempt will be made to review these matters comprehensively, except in so far as they have been modified or elucidated by the additional data now available. It has been found convenient in this review, to adopt the same sequence of topics formerly employed, beginning with the

Spore Characters. Amorphomyces still remains the only genus in which a simple spore replaces the hyalodidymous form characteristic of all the other genera, and the reference of *A. Floridanus* to its proper place under the new genus *Dioicomyces,* shows that this simple character in the spore is correlated with an absence of any appendage, or sterile cell, connected with the primary receptacle; a condition found in no other instance. The only spore modification of interest that has been observed among the hyalodidymous forms, is found in the last mentioned genus; the spore-septum of which is more or less conspicuously oblique (Plate XLII, figs. 17 and 29) and this genus also, as may be seen by reference to the figures cited, illustrates in a striking fashion, the differentiation which may be apparent between the male and female spores in diœcious genera. It may be here remarked that the cytological phenomena in this connection, which lead up to the sexual differentiation and pairing in the ascus of these male and female spores, is likely to prove of unusual interest.

Moschomyces and *Compsomyces* remain the only genera in which the presence of octosporic asci has been definitely determined. The writer has been unable to satisfy himself, however, that this is not also the condition in *Herpomyces.* If this were actually the case, it would involve the curious phenomenon of absolute sex differentiation in the last mitosis, which would not necessarily occur in a four spored ascus.

In almost all the species the first step in germination consists, after the spore has become attached, or even before, in the formation of the familiar hoof-like organ of attachment and absorption, the foot: an indurated, firmly attached, blackened rim, surrounding a thin membrane which is in direct contact with the surface of the host and through which materials are absorbed into its cavity, the latter being, as a rule, in direct communication with that of the basal cell of the receptacle; although, in some instances at least, it is evidently separated by a septum, Plate XLIX, fig. 16.

The nature of this foot may be somewhat variable. In *Coreomyces,* for example, it may be modified to form a spreading, almost rhizoidal structure, Plate LXXI, fig. 14, of characteristic appearance somewhat similar to that of *Zodiomyces.* The most striking departure from the normal type, however, is seen in a relatively small number of species, and was illustrated in the writer's earlier Monograph (*Moschomyces* and *Rhizomyces*). In these instances the parasite obtains its nourishment directly from the body-cavity of the host by means of a penetrating intrusion. Such intrusions are usually associated with growth on a thin or soft integument. Thus *Moschomyces,* in which the penetrating organ expands to form a cellular cushion, grows on the thin integument beneath the elytra, or at the bases of the legs of its otherwise hard-shelled host. But the most striking instances of this nature are seen in forms which live on soft bodied Diptera, and produce a more or less well developed filamentous rhizoidal apparatus. In *Dimeromyces rhizophorus* the thin skin on the under surface of the abdomen of a small fly is perforated, as is shown in Plate XXVIII, figs. 6–8, and a stout tapering filament extends some distance into the semi-fluid contents of the abdomen, furcate in the female, and simple in the male individual. A beautifully developed branching rhizoid is seen in *Ceraiomyces Dahlii,* Plate XLIII, fig. 4, and a still more copiously branched organ of this nature is present in the species of *Arthrorhynchus,* the copious and intricate branching of which is merely suggested in Plate XLVIII, fig. 2.

It is a remarkable fact that the presence or absence of such penetrating organs is not necessarily an attribute of all the species of a given genus, or even of those which grow on the same, or similar hosts. Thus *Ceraiomyces Selenæ* and *Rhizomyces crispatus* both possess a typical foot, although all the other species of these genera are rhizophorous. *Dimeromyces rhizophorus,* moreover, is the only species in a considerable genus, which has this character; although the closely allied *D. coarctatus* grows under exactly the same conditions in the same position on a similar soft bodied host. In the genus *Stigmatomyces,* the species of which with few exceptions occur on soft bodied flies, not a single instance of this nature is known, nor does *Laboulbenia Hageni,* on the delicate integument of the soft bodied Termites, develop any intrusion from the normal foot figured, from below, in Plate III, fig. 4, of the former Monograph. An isolated instance in which the usual foot is combined with a penetrating organ, occurs in the genus *Herpomyces,* all the species of which possess slender simple rhizoidal threads, which penetrate the host-integument from the foot itself, and are similar in all respects to the rhizoids developed from the cells of the remarkable creeping secondary receptacles which characterize all the species of this genus.

Although forms in which these organs replace the ordinary foot do not appear to gain any very appreciable advantage as regards nutrition, at least in so far as is indicated by size or luxuriance, there can be no doubt whatever that their function is one of absorption; since they are thin-walled, with dense protoplasmic contents, and are not developed in such form as one would expect were their function that of holdfasts merely. That they combine the office of holdfasts with that of absorbing organs is, however, manifest; since otherwise the individuals would be easily detached. Thus in *Arthrorhynchus*, as indicated in figs. 2 and 7, Plate XLVIII, and in *Ceraiomyces Dahlii*, Plate XLIII, figs. 3–4, a somewhat abrupt swelling of the rhizoid immediately within the host-integument makes the removal of an individual impossible without breakage, either of the host or of the parasite, and in *Dimeromyces rhizophorus* the same end is attained by the abrupt divergence of the two branches to which the rhizoid immediately divides on entering the body cavity. Cavara, in his paper above cited, criticises the writer for having given scant attention to this matter of the method of food absorption, having apparently overlooked such references as were made to the subject (Monograph, pp. 204–5). The theory advanced by Cavara that the appendages are the organs of absorption, would seem untenable even were it not true that appendages are sometimes wholly absent in these plants; since a majority of the forms come in no immediate contact with water, except such as may be condensed on the surface of the host, and it is not probable that the material necessary for the growth of chlorophylless plants rich in fat etc., can be taken from the air. In general, too, the appendages are surrounded by the same impermeable membrane that covers the other portions of these plants, and would appear to afford ineffective organs of absorption, even were the surrounding medium a favorable one for obtaining food materials. The rigid limitation of species of Laboulbeniales to single genera, or even species, of insects, which holds in general throughout the group, could hardly, it would seem, be explained on a basis of pure saprophytism; and although, as previously stated, the growth of these plants is not associated with any appreciable injury to the host, it is nevertheless a true parasitism of a typically obligate type. In this connection it may be mentioned that one case has been observed in which definite injury is done to the abdomen of a soft bodied host. The instance referred to, however, is not one in which the parasite possesses an intrusive haustorium; but was seen in a number of the small flies parasitized by large numbers of *Dimeromyces coarctatus*. In these cases a definite lesion, so to speak, appeared to be associated with the presence of the parasites, and was indicated by a brown discoloration and by a shriveled condition of the parts attacked.

The Structure of the Receptacle, although it is in general an uncertain guide in tracing general relationships in the family and may in some instances vary very considerably in different species of the same genus, or even in individuals of the same species, affords nevertheless characters of very considerable diagnostic value. The large number of generic types herewith enumerated show so many variations and combinations in this respect that it will not be possible in the present connection adequately to discuss and compare them; yet certain of their types and general tendencies need to be mentioned, in order that the conditions hereafter illustrated may be properly understood. It was formerly pointed out in the earlier Monograph that the vegetative body of these plants, like that of the Red Seaweeds, is in general reducible to a system of branching filaments which, in the present instance, is chiefly peculiar from the fact that the system is, or tends to become, determinate in given genera and species, and that this determinate character is absolute, as a rule, in the more highly specialized portions of the thallus, like the perithecia and compound antheridia. In considering the variations of the receptacle, it is thus convenient to distinguish in a general way, those forms which are determinate, as in *Stigmatomyces*, *Ceratomyces* etc., from those in which, as a result of secondary cell divisions, whether terminal or intercalary, the cell-number becomes more or less variable, as in *Ecteinomyces*, *Dichomyces* etc. In the second of these types, two categories may be further distinguished; namely those in which the indeterminate character results from an intercalary division of the main axis, a condition well illustrated by *Dimeromyces pinnatus*, Plate XXIX, fig. 16, and secondly those in which the secondary production of cells is due to the development of branches, or secondary axes, such as occur in *Kainomyces*, *Monoicomyces*, *Dimorphomyces*, *Dichomyces* and other genera, usurping the function of the primary receptacle by giving rise to perithecia, or antheridia, or both.

It is thus convenient to distinguish types which possess a *primary receptacle*, only, corresponding to the original axis of the basal spore-segment, and immediately concerned in the production of procarpic branches; from those in which the primary receptacle, though present, is sterile; the production of sexual organs being relegated to secondary axes which branch laterally from it and may be distinguished as *secondary receptacles*. Among genera of the first category, in which the primary receptacle is determinate and fertile, those types in which the latter consist of two superposed cells are the most common, and of these the simplest condition is illustrated by *Amorphomyces*. In neither sex of this diœcious genus is it associated with sterile cells or appendages; the type being quite anomalous in possessing a continuous spore, from which the procarp in the female, as well as the antheridium in the male, develop terminally. In no other genus is the axis of the procarp continuous with that of the primary receptacle, although, as in *Kainomyces*, it may sometimes bear this relation to its branches. This condition is directly dependent on the fact that in all other genera, even in the very closely related *Dioicomyces*, the spore is onceseptate, the distal segment becoming a "primary appendage," which is either sterile, or is concerned in the production of antheridia. This condition is illustrated on the one hand by *Dioicomyces*, the species of which possess a two-celled receptacle surmounted by a sterile portion corresponding to the distal spore-segment and bearing the procarp laterally; and on the other by such genera as *Eucantharomyces*, *Stigmatomyces*, *Corethromyces* and many others, in which the terminal spore-segment produces an antheridial appendage of varying complexity.

Instances in which the primary receptacle is two-celled and sterile, are found in both the monœcious and diœcious genera, and by far the most remarkable illustration of this condition is seen in *Herpomyces*, in which the perithecia are borne on secondary receptacles that are more clearly differentiated than in any other instance. In the female individuals of the species of this genus, Plates XXXIX–XLI, a variable number of branches may thus arise, which originating as simple cylindrical filaments, soon become cellular, forming secondary receptacles which creep more or less extensively, or are variably multiplied in different species by branching; perforating the host-integument, as has been above described, by means of thread-like rhizoids which render these structures independent of the original foot as far as their food-supply is concerned. This peculiar condition is in general confined to the female individuals, although in *H. Ectobiæ* it is equally prominent in the male. Branches which become adherent to the host have been described in no other instance, although they are known to the writer in one other peculiar diœcious genus as yet undescribed, but it is not difficult to imagine that such a condition might either have originated from, or, on the other hand, have been modified to form conditions such as are found, for example, in *Dimorphomyces,* and especially in *D. Myrmedoniæ,* Plate XXVIII, fig. 14, in which the elongate secondary axis, projecting as it does laterally, and at right angles, from the short primary receptacle, may rest against the surface of the host, although it does not become attached to it. Of forms in which both male and female organs occur on the same branches, *Monoicomyces* furnishes a striking example well illustrated by *M. St. Helenæ,* Plate XXXVI, fig. 8, in which they are more than usually elongated.

In this connection attention should be called to certain forms in which the primary receptacle is obliterated at a very early period by the growth of its fertile branch which has the appearance of being directly continuous with it, the two axes becoming coincident. This condition is found in all species of *Rhachomyces,* Plates XLIV and XLV, and accounts for the apparently simple axis in most normal individuals of *Monoicomyces Leptochiri,* Plate XXXIV, fig. 39. Among other forms having two-celled receptacles, which seem to belong in this general category, two other genera need special mention, namely *Moschomyces* and *Compsomyces,* in which the secondary perithecial axes are single appendiculate cells, continuous with and hardly distinguished from the perithecial stalk-cells, so that the perithecium appears to be borne on a double stalk-cell. A somewhat similar condition is seen elsewhere only in the perithecial branches which arise from the massive receptacles of *Zodiomyces* and *Euzodiomyces.*

Turning now to instances in which the basal spore-segment becomes divided more than once to form the primary receptacle, a variety of conditions may be found, but the same general distinctions previously outlined may be recognized. Thus the primary receptacle may be determinate or indeterminate, and the procarps may arise either directly from it, or from its more or less evident lateral branches.

Instances of determinate receptacles of more than two cells, from which the procarps arise directly, are rare, and may be illustrated by the genus *Ceratomyces* as limited in the present paper, and by *Autoicomyces,* Plates LXVIII–LXX. Whether the peculiar genus *Teratomyces,* Plate XLIX–L, might not be included here, is uncertain; since the exact origin of its perithecia is as yet unknown, although they seem certainly not to arise from the third cell of the receptacle. Whether the cell above this should also be regarded as a part of the primary receptacle, has not been determined, in the absence of a complete series from the germinating spore; but both the perithecigerous and the appendiculate cells appear to arise as proliferations from it. The conditions in *Symplectromyces,* are evidently similar, and the beginning of this condition is perhaps illustrated by *Idiomyces.*

Of indeterminate receptacles from which procarps arise directly, one of the simplest types is seen in the anomalous genus *Chætomyces,* formerly illustrated; but a complete series, in which the relations between the ultimate products of the two spore-segments can be determined, has not as yet been examined. In contrast to this form in which the number of secondary divisions is small, the cell-number thus varying within restricted limits, *Ecteinomyces* may be mentioned as one in which differences due to secondary elongation may be extreme, Plate LI, figs. 15–17, and a similar though less variable condition is illustrated by *Hydrophilomyces,* Plate LXVIII, figs. 1–2. The female individuals of *Dimeromyces,* and even the males, may also be thus secondarily modified, a condition strikingly illustrated by *D. pinnatus,* Plate XXIX, fig. 16. *Enarthromyces,* among the monœcious forms with compound antheridia, affords another instance of the same nature; but one in which the secondary elongation does not result, as in the last mentioned instance, from continued division of the basal cell.

Among types in which the procarps are borne on branches which arise from indeterminate primary receptacles, the most striking and peculiar is seen in *Kainomyces*, the massive receptacle of which gives rise to lateral axes of superposed cells terminated by perithecia, Plate LXXI, figs. 20–21. *Zodiomyces* and *Euzodiomyces*, both conspicuous for their massive receptacles, also produce their perithecia terminally on short branches, as has been already mentioned. A very peculiar type which seems to belong here, although no young material has been examined, is seen in *Clematomyces*, Plate XLIII, fig. 1. Here a stout main axis, consisting of a double row of cells, gives rise to a variable number of branches similar to it in structure; but how much of the former corresponds to the basal spore segment it is not possible to say.

Lastly the genus *Dichomyces* which, by assuming a scale-like habit, has beautifully adjusted itself to its life on the abdomen of a swiftly running host, illustrates a condition in which a seemingly broadly multicellular primary receptacle consists in reality of a central and invariable axis of superposed cells, corresponding to the basal spore segment, which produces branches right and left above the basal cell, in many species symmetrically paired. Although these branches may be variably united to one another above and below, and thus give the appearance of a cellular mass, they may in other cases be almost wholly free, especially the upper pair,-as is well illustrated by *D. biformis*, Plate XXXIII, fig. 3. The genera *Peyritschiella*, *Limnaiomyces*, *Chitonomyces* and *Hydræomyces* are all more or less evidently similar in the development of their receptacles. In the very closely allied genera *Rickia* and *Distichomyces*, which, however, form a well marked group by themselves, the development of the receptacles, which is given in some detail below under these genera, although of a different character from that of the *Dichomyces*-type, is similarly resolvable into series of coherent branches.

Before leaving the subject of receptacles, attention should be called to certain peculiar modifications of the basal cell which are evidently protective, acting as supports or buffers, and consist of more or less indurated outgrowths, most conspicuously illustrated by *Kleidiomyces*, Plate XXXVII, fig. 3, and to a less extent by *Corethromyces Stilici*, Plate L, figs. 6–9. A similar supporting and protective function is no doubt served by the blackened fork-like upgrowths from either side of the subterminal tier in many species of *Dichomyces*, Plate XXXII, although these structures, being modified tips of lateral branches, are morphologically quite different. In this connection the remarkable extension of the basal cell in species of *Dimorphomyces*, and especially in *D. Myrmedoniæ*, Plate XXVIII, fig. 14, should be referred to, forming as they do a continuous supporting margin below the laterally developed sympodial perithecigerous branch. The small beginnings of conditions such as the two first above mentioned, are to be found in such occasional modifications as were formerly described and figured in connection with *Laboulbenia Philonthi* and *Compsomyces verticillatus*, Monograph, Plates XI, fig. 13 and XXII, fig. 28, and the foot-like modification of the receptacle in various species of *Ceratomyces* undoubtedly serve a similar purpose.

Appendages. An appendage of some kind is present in all genera with the single exception of *Amorphomyces*, which in this, as in other respects, is the simplest known generic type. In all others, the spore being two-celled, the distal segment is transformed into a structure corresponding to a primary appendage, although in male individuals of unisexual types having simple antheridia, like *Dioicomyces*, the distal segment may be transformed directly and *in toto* to an antheridium. The new genera here included offer few general types not described in the former Monograph; but certain ones need special mention, which may be more conveniently made in connection with a brief review of the more important types of antheridia. The distinction between the primary appendages, which are always derived from the upper spore-segment, and the secondary appendages having a different origin, is usually clearly recognizable; but is sometimes obscured, as in the case of *Teratomyces* and *Symplectromyces*, above referred to, the relation of the crowded appendiculate cells in these forms, to the terminal segment, being uncertain.

The new material now available illustrates more fully than was formerly possible the range of variation in the primary appendages. The simplest type, a two-celled sterile prominence, is seen in female individuals of *Dioicomyces*, and in other types may become complicated by further divisions, as well as by the production of sterile branches; and may remain wholly sterile, or be concerned in the formation of antheridia, or antheridial branches. The latter condition is that which is usually, though not always, found in monœcious types; in which the primary receptacle is directly concerned in the production of procarps. Thus in *Stigmatomyces*, or in *Eucantharomyces*, Plate XXXVIII, the primary appendage is largely devoted to this purpose, while in *Enarthromyces* or in *Coreomyces* it is wholly sterile. Among more highly developed primary appendages, those of *Rhizomyces crispatus*, Plate LII, fig. 19, and *Corethromyces Cryptobii*, Plate LI, fig. 3, may be taken as illustrations; while many members of the genus *Laboulbenia*, in which the stalk of the perithecium is combined with that of the appendage to form a pseudo-receptacle, indicate perhaps the highest development of a primary appendage. This is especially well illustrated, for example, by *L. bicornis*, Plate LXVII, fig. 1, or by *L. spectabilis*, Plate LVII, fig. 12.

In a number of genera, not necessarily related, the primary appendage bears a characteristic spine-like process, to which reference was made on page 209 of the Monograph. This is especially conspicuous in *Haplomyces*, *Stigmatomyces*, *Arthrorhynchus* and *Acompsomyces*, among others, and appears to be nothing more than the persistent spore-apex, its presence thus marking the position of the absolute termination of the upper spore-segment. It is formed in all probability almost entirely from the attenuated extremity of the mucous spore-sheath, which in such cases becomes indurated and persistent. In *Herpomyces* it is generally associated with a minute appendage of a different type, small, blackish and characteristic in appearance, but probably of secondary origin. The spinous process may be terminal in the adult appendage, lateral on a terminal antheridial cell, as in many species of *Stigmatomyces*, or intercalary in position through the proliferation of the appendage beyond it, a condition seen also in species of *Stigmatomyces*, as well as elsewhere.

The theory advanced by Cavara that these plants absorb their food materials by means of the appendages, has been referred to above. But there seems to be no reason whatever for believing that their function is other than that formerly suggested, namely one primarily for protection, where they are sufficiently developed to perform this office, and for holding moisture about the perithecium or sexual organs; as in forms, especially, that live on hosts frequenting moist situations, where water is sure to be condensed upon their surface. That water is actually held in drops by the appendages is easily determined when living hosts are collected under stones, or in other situations which favor the condensation of moisture; yet, although there is perhaps a distinct tendency to a brush-like development of branches in forms thus conditioned, the exceptions are marked; and any generalization in this connection would be unsafe. *Haplomyces*, for example, inhabits a host, *Bledius*, that lives in moist burrows in mud or wet sand, and is thus exposed for the most part to a nearly saturated atmosphere, yet the appendage is of the simplest type, without sterile branches of any kind, although the closely allied *Cantharomyces*, living on the same host is thus provided. Again *Rhizomyces crispatus* has already been referred to as an example in which the appendage is remarkably developed, yet the host is a fly which may be assumed to spend most of its life, at least, in the free air, although it is said to be riparian.

Male Sexual Organs. A general division of the Laboulbeniales was formerly made by the writer on a basis of the differences which appeared to exist in the method of abjunction of the sperm-cells; those in which the latter were endogenously formed, being discharged free from a specialized antheridial cell, "Endogenæ", and those in which they appeared to be exogenous branchlets, or segments of branchlets, separated from the appendages, "Exogenæ". It appears somewhat doubtful, however, whether this distinction can be as clearly drawn as was at first supposed, in view, particularly, of the conditions seen in *Corcomyces,* a genus very remarkable in its structure and development. The antheridial cells in this instance, are merely undifferentiated cells of secondary appendages arising as branches from special cells of the receptacle lying below the origin of the procarp, and not corresponding to any portion of the primary appendage, which is wholly obliterated during the development of the perithecium. As in *Rhynchophoromyces rostratus,* (Monograph, Plate XXIV, figs. 21–24), the antheridial cells are intercalary as well as undifferentiated; but in the present instance develop a short cylindrical neck through which free sperm-cells are discharged very much as in the endogenous forms. That there is a gradual transition, rather than a sharply defined line of demarcation between these two general types, is further suggested by the conditions seen in *Hydrophilomyces,* the species of which were formerly included in *Ceratomyces.* If the structures represented on Plate LXVIII, figs. 3–4, are in reality antheridia, we have here a type that, although in many respects it corresponds closely to that of the *Ceratomyces*-group which is likewise aquatic, discharges its sperm-cells free, from cells which are almost as distinctly specialized as are those, for example, of *Compsomyces* or of *Ecteinomyces,* Plates XLIII, fig. 12 and LI, fig. 18. The antheridia of *Kainomyces* and *Euzodiomyces,* genera the near relationship of which to *Zodiomyces* may be assumed, are as yet unknown, owing to the imperfect character of the material available. Neither is the nature of the male elements absolutely determined in *Ceratomyces,* or in *Autoicomyces,* in both of which they appear, however, to be segments of certain slender branchlets. The conditions existing in the genus *Misgomyces* also, which may be related to these forms, are still unknown; so that, as far as any definite production of exogenous male elements is concerned, it must be confessed that it is definitely known only in *Rhynchophoromyces* and *Zodiomyces.* Until the exact conditions can be determined in the cases above referred to, this general distinction must remain of doubtful value, and in attempting to construct a key which should at the same time indicate in a general way the relationships of the genera, the main divisions have been based on the differentiated or undifferentiated character of the antheridial cells, a distinction which, however, can be considered by no means absolute, since it might exclude from the latter class *Hydrophilomyces,* a genus, as above suggested, apparently most nearly related to the *Ceratomyces*-group.

A further general distinction was made in the group of so-called Endogenæ, based on the compound or simple nature of the antheridia: the *simple* type consisting of cells indeterminately placed, or more or less definitely associated, free, or at least with free and independent efferent tubes; the *compound* type involving not only the definite association of several or many antheridial cells in a determinate group, specific in its character, but also a different method of discharge; the efferent tubes of all the antheridial cells composing such an antheridium, opening into a common cavity, whence the sperm-cells make their exit through a single opening or passage. Although this distinction appears to be almost absolute, and seems to be entirely so as far as the cell relations in development are concerned, a single instance has been found among the recently discovered genera in which the antheridial cells, although they almost certainly originate as in typical compound antheridia, become ultimately free in a compact group, each discharging independently; the cell below which they were formed and through which they would normally discharge by means of a common opening, being sloughed off and destroyed early in their development. The genus *Distichomyces* in which the conditions just described appear to exist, is so closely allied to *Rickia* that it might almost be included in it, yet in *Rickia* highly specialized compound antheridia are present. Moreover the close relationship of both these genera to the group of genera assembled about *Peyritschiella,* and possessing typical compound antheridia, cannot for a moment be questioned. If therefore, one makes an absolute distinction based on the characters of the mature antheridium, as has been done in the tentative key to the genera herewith appended, the genus *Distichomyces* would naturally be sought among the "Laboulbeniaceæ" where it certainly does not belong.

The type of the simple antheridium is in general a very constant one, although there may be a rather wide variation in the minor characters, the form of the venter, length and curvature of the neck, and the relative proportions of its two parts. The relations of the simple antheridia to one another, when they occur in groups, was formerly emphasized as a matter of importance in distinguishing certain genera and species, the serial arrangement being the most distinctive. The genus *Stigmatomyces,* to which many species have recently been added, illustrates this condition very clearly, although in this highly differentiated appendage, the antheridial cells are not always, or even usually, as was formerly stated, superposed in a single row, as is the case in *S. virescens,* or *S. purpureus,* Plate XLVI, fig. 36; but a series of sympodia is formed, each antheridial branchlet separating a basal cell, which in turn grows out directly to form a second antheridium, so that the series is double at least in the lower portion of the appendage, Plate XLIX, fig. 13. The lowest groups may even produce more than two antheridial cells, as in *S. constrictus,* Plate XLVI, figs. 1–2. This last condition tends to break down the distinction based on antheridial series between this genus and *Arthrorhynchus,* Plate XLVIII, in one species of which, fig. 3, the arrangement is very similar. A single type in which the antheridia are strictly intercalary, like those of *Corethromyces,* has been added in the genus *Symplectromyces,* Plate L, figs. 14–16, but this relation appears to be a rare one. The number of antheridial cells in such associations appears to be more or less definite in certain cases. In a majority of the species of *Stigmatomyces,* for example, this character seems to be one of the most useful in distinguishing species, while in *Teratomyces,* on the other hand, in which the antheridial branch is also a monopodium, there is absolute irregularity in this respect. A new and very individual type of appendage somewhat similar to that of *Stigmatomyces* is seen in *Acompsomyces,* and another less well defined in *Acallomyces;* these appendages being in general simpler and tending to break down any abrupt line of demarcation between types of appendages with serially arranged antheridial cells, and those in which the latter are irregularly placed. A few instances occur in which the grouping of the antheridial cells is of specific, though not of generic value, a condition best illustrated, in the genus *Laboulbenia,* by such species as *L. Oezenæ,* Plate LXIII, fig. 11, or *L. variabilis.*

The transition between simple, but distinctly differentiated, antheridial cells, and the undifferentiated segments of an appendage or its branches, which may serve a similar purpose, has already been referred to, and is illustrated most clearly by *Corcomyces,* Plate LXXI, fig. 13. These segments, although they discharge their contents in a similar fashion, are evidently variable in size and form, and are associated with similar segments having no such function. This function, furthermore, appears to be a transitory one, and as far as has been determined, the discharge of sperm-cells ceases soon after fertilization, and the appendage develops more or less copious sterile branches and loses all traces of its primary function, figs. 7 and 16; a statement which, it may here be mentioned, applies also to the supposed antheridia of *Hydrophilomyces*.

The associations of antheridial cells which form the functional portion of the often highly developed compound antheridia are in general very definite, and the numbers of the latter may be, and usually are, more or less invariable in different genera or species. They arise, like the simple antheridia, as branchlets, which, instead of growing outward, penetrate an adjacent cell, opening and discharging into its cavity, whence the sperm-cells escape by a variably developed, often tubular and elongate outlet, that is sometimes a mere extension of the cell forming the common cavity, or in a few instances involves other cells. An illustration of the last condition is seen in the antheridium of *Euhaplomyces*, Plate XXXVII, fig. 21, a type not previously illustrated. Another new type is seen in the genus *Rickia*, the antheridium of which is quite unlike that of the nearly allied *Peyritschiella*; not, as in this genus, adnate to the receptacle, but borne quite free upon it and distinguished by a broad black septum, Plate XXXIV, figs. 12–13. In general form it closely resembles a simple antheridium of the ordinary type, but the several antheridial cells which compose it are nevertheless clearly distinguishable. The singular condition seen in the closely allied *Dichomyces*, with its groups of apparently simple and free antheridia, has already been referred to above. The most remarkable, however, among the new types illustrated, are those found in the two new genera, *Monoicomyces* and *Eumonoicomyces*, Plates XXXVI and XXXVII, the detailed structure of which is described under these genera. This type, which in *Eumonoicomyces Papuanus* is more complicated than that of any other form, differs widely from those previously illustrated, both in the arrangement of the antheridial cells, and in the method of discharge between four terminal and eventually appendiculate cells. Still another new type is found in the singular *Kleidiomyces*, but unfortunately the cell relations here are not determinable from the scanty material available. Lastly the many new species of *Eucantharomyces* illustrate very fully the variations in this highly developed type, in which the usually oblique rows of cells which give it such individuality, appear to represent the intercalary segments of an original branchlet, that become converted directly to antheridial cells which discharge inward.

Of the fifty-four genera thus far distinguished there are five in which the character of the antheridia is quite unknown, namely, *Polyascomyces*, *Smeringomyces*, *Misgomyces*, *Euzodiomyces*, and *Kainomyces*, while in the following genera these organs are but doubtfully determined: *Chitonomyces*, *Hydræomyces*, *Ceratomyces*, *Autoicomyces*, and *Hydrophilomyces*.

Female Sexual Organs. The general account formerly given of the origin and development of the procarp, appears to be substantially correct, and little new information in this connection has been obtained. One type of trichogyne, not formerly observed, is seen in *Acompsomyces*, the clavate extremities of which are beset in a very characteristic fashion, Plate XLII, figs. 8 and 12, with receptive vesicles, which might at first sight be taken for conjugating sperm-cells.

A most singular departure from the normal method of origin in the procarp is seen in *Coreomyces* in which not only the female branch, but also the sterile cells of the perithecium, originate endogenously, growing, like the antheridial cells of compound antheridia, into the cavity of the adjacent cell above. Not only is this cell traversed by the procarpic, and later by the perithecial branches, but several cells above are successively penetrated, the intervening septa being perforated and destroyed; the free trichogyne eventually making its way out distally and replacing the terminal primary appendage, which is sloughed off. This very peculiar condition, which is illustrated on Plate LXXI, and described in detail under the genus, has no counterpart in the group. The perithecia of *Zodiomyces*, although the branches which produce them arise endogenously, are themselves exogenous, and quite free from the beginning of their development. In *Ceratomyces*, also, although the formation of the perithecium is not of the ordinary type, the conditions do not appear to be in any way comparable.

The early development of the carpogonium after fertilization has been described in detail in the Monograph, and appears to be similar throughout the group. The only striking phenomenon in this connection that has been observed among the new forms is seen in the genus *Polyascomyces*, in which the ascogenic cells become so greatly multiplied that a condition occurs not unlike that seen in the perithecium of other Ascomycetes, more than thirty ascogenic cells covering a basal area from which large numbers of asci bud upwards; Plate XXXVII, figs. 1–2.

The cytology of ascus- and spore-formation has been examined by Dr. Faull who has published a preliminary note in Science, already referred to, and has kindly allowed the writer to examine his preparations. The latter appear to show that the phenomena involved correspond essentially with those in other Ascomycetes, the ascospores being formed as a result of the divisions of a fusion-nucleus by a process exactly similar to that which is normal in this type of spore-formation. Since Dr. Faull has not as yet published a full account of his results, the writer does not feel at liberty to make further reference to them in the present connection.

The structure of the mature perithecium is, in all genera, fundamentally the same, except in the case of the pseudoperithecium of *Coreomyces*, and has been given in detail in the Monograph. The most important variations relate to the number of cells in each of the four outer and of the four inner and alternating rows of wall-cells, and to the production of outgrowths or appendages from the outer rows. A curious condition has, however, been observed in *Dichomyces*, some species of which show a remarkable dimorphism in their perithecia; the two forms being associated on the same individual as in *D. hybridus*, Plate XXXI, fig. 16; or occurring, as in *D. biformis*, Plate XXXIII, figs. 2–3, on distinct individuals. In both these instances it will be observed that the two varieties are not only unlike in size and form, and to some extent in color; but that, while in one auricle-like outgrowths are present, these are wholly absent in the other. Two forms of perithecium also appear to occur in *Rhizomyces crispatus*, Plate LII, figs. 19–20, although in this instance it is barely possible that two species are concerned. It is possible that the dimorphism in *D. hybridus*, may have resulted from hybridization, for example between a form like *D. furciferus* and the common extra-Asiatic from of *D. hybridus*, which is not known to possess auricles. This dimorphic condition, however, appears to occur in other species, and it seems unlikely to the writer that it can be explained in this way. Among instances in which the perithecium may show wide differences in form in a given species, *Laboulbenia Polyhirmæ* may be mentioned, Plate LXV, figs. 1–3; and the varieties of *L. Texana*, if these are rightly separated merely as varieties, show very remarkable conditions in this respect, Plate LXIII, figs. 3–9.

That a *Sexual Condition* exists in these plants and that the organs alluded to as antheridia, sperm-cells, procarps, trichogynes etc. actually have the functions which their names imply, has been assumed in the above account. Although no one who has a knowledge at first hand of the Laboulbeniales in a living condition would for a moment doubt the correctness of this assumption, it should be mentioned here that the cytology of the reproductive process is still unknown, however clearly its general nature may be indicated by the observed morphology, and certain writers have denied *in toto* the sexual nature of the supposed male and female organs. Alfred Moeller, for example, although he has no personal knowledge of these structures, makes the statement without reservation, (Schimper, Bot. Unters. a. d. Tropen, IX, p. 45, 1901) that the so-called antheridia are merely conidiophores, producing conidia, the supposed sperm-cells, in a *Chalara*-like fashion. Yet if these supposed sperm-cells are in reality non-sexual propagative bodies, it seems singular, since they are produced in enormous quantities in many cases, that no indication has ever been seen which would suggest the possibility that individuals ever arise from bodies other than the ascospores. If individuals were ever developed from these minute micrococcus or bacillus-like, for the most part naked, protoplasmic masses, such an origin would certainly have been indicated in some instances among the great mass of material examined. The whole history of the early development, moreover, forbids such an assumption, and especially the conditions found in the unisexual forms. That matters should be so arranged in the latter that a conidial and an ascigerous individual should be invariably predetermined in every spore-pair, seems a manifest absurdity. The conidial theory also, overlooks the trichogyne, often a very remarkable and highly differentiated structure, as well as the adherence of the "conidia" to certain special portions of it. Even if one could be contented with some of the utterly ridiculous explanations of "trichogynes" found elsewhere among the fungi, that have been gravely advanced, it would be difficult to see, for example, in the present instances, why a "ventilating apparatus" should cease to ventilate and should disappear at the very moment when the active development of the region ventilated was beginning and when "ventilation," one would suppose, would be most necessary. That these structures are designed to "terebrate" the empty air is also, to say the least, an unsatisfying explanation of their presence.

Abnormalities among the Laboulbeniales occasionally occur, some instances of which have been previously illustrated, as for example the substitution of an antheridial appendage for a perithecium. Instances of this nature in which bisexual individuals may become unisexual through the atrophy of the perithecium, and the substitution for it of antheridial branches, are not uncommon; but another example of a different nature is sometimes found, and results from the partial atrophy of one member of the spore-pair. The failure of one member of a spore-pair to develop, was noted and figured in connection with *Laboulbenia inflata* in the Monograph, and has been seen in other instances. While, however, such undeveloped individuals are, or appear to be, quite functionless, cases have been seen in which, although one member becomes normally developed, producing an antheridium and procarp, the other develops normally as far only as the production of the antheridium is concerned and shows not the slightest indication of any procarp. Such an instance is represented on Plate XLIX, figs. 16–17, the two individuals being the products of the same spore-pair. The abnormal production of perithecia is a common occurrence in some genera, and has been previously described and figured. It has been seen occasionally in *Laboulbenia proliferans* also, the secondary perithecia arising from the subbasal cell and thus confirming the view taken by the writer as to the homologies of the receptacle in this genus.

Of abnormalities more or less directly due to environment and resulting from growth under continuously unfavorable conditions, as for example exposure to violence or insufficient nutrition, numerous instances might be cited in which the general form and the character of the appendages may have been thus modified. The most remarkable instance, which appears to be of this nature, is seen, however, in the genus *Dichomyces,* and results in a structural variation which may be in the nature of a reversion. In several species, especially when large numbers grow crowded on the legs of swiftly running hosts, the normal symmetry is lost and the individual assumes a structure exactly like that of the genus *Peyritschiella,* although under favorable conditions, as on the abdomen, this form never appears. Such a condition of *D. inæqualis* was formerly figured and described as a new species of *Peyritschiella, P. nigrescens,* and it seems not impossible that this phenomenon may be comparable to reversions resulting from injury in the higher plants. That abnormal forms due to hybridization may exist, has already been suggested above, and this may account for the confused variations seen, for example, in *Dichomyces vulgatus* or *D. princeps. Laboulbenia melanotheca,* also, may possibly be nothing more than a hybrid between *L. Mexicana* and some of the species with black perithecia often associated with it, although this is of course a mere suggestion.

The *Geographical Distribution* of the species and genera is now sufficiently well known in many instances to illustrate various points of interest in this connection, but in view of the limitations of the present paper as to space, and the fact that large additional collections of these plants are now awaiting examination and study, no general summary or tabulation of distribution will be here attempted. Information in regard to distribution is most complete in reference to parasites of the Carabidæ; since this family of beetles is a favorite group among entomologists, and is extremely well represented in a majority of the exotic collections examined. Since, also, these insects include a majority of the hosts infested by species of *Laboulbenia,* it is in this genus that the most complete data as to special instances of distribution have been obtained. A brief reference to the subject will be found below under this genus, but it may be remarked in this connection that it is singular to find a species like *L. variabilis* infesting a variety of common genera in both American continents, yet quite unknown elsewhere; while the distribution of *L. Pheropsophi* is coextensive with that of its host in five continents. Of the numerous species on *Galeritæ* in South and Central America none extend to Africa, where *Galeritæ* are numerous in species, and are attacked by a single form only, unrelated to the South American one. Again *L. Philonthi,* which is the common form in North and South America on members of the very large and universally distributed genus *Philonthus,* is unknown from other regions, although almost unlimited material has been looked over; while *L. cristata,* the only species growing on members of the large and varied genus *Pæderus,* has been found from all the continents.

The *Development of Series* in the Laboulbeniales, the directions in which this development has proceeded, and the determination of what characters may be considered primitive or the reverse, are matters of interest concerning which, however, the writer finds himself unable to arrive at any satisfactory conclusions. On the assumption that these plants have been derived from aquatic ancestors, one would naturally look to the existing aquatic forms, rather than the terrestrial ones, for suggestions as to primitive conditions. The aquatic forms which possess compound antheridia, as is evident from the structure of *Limnaiomyces,* are identical in type, and closely related to, the much more numerous and more highly developed terrestrial genera of the Peyritschiellaceæ, and the same may be said of the often very highly developed aquatic species of the genus *Laboulbenia.* It is therefore among the Ceratomycetineæ, of the accompanying Key, that one would look for suggestions in this connection. That the vegetative characters of this series, far from being simple, are quite the reverse, might have no significance in this respect; but if one presupposes an origin for the group from aquatic types near the simpler Florideæ, it is evident that in these water forms, the antheridial characters, which afford by far the most reliable and fundamental characters for general groupings in these plants, are more unlike the antheridia of the red algæ than those of the more highly developed terrestrial genera. In any attempt to arrive at a conclusion concerning these matters, several fundamental questions need answers which are not as yet forthcoming. First, has the unspecialized antheridial cell of *Rhynchophoromyces* or *Zodiomyces*, for example, become the specialized cell of the Laboulbeniaceæ, through conditions which may be suggested by those found in *Coreomyces*; or has the passage been in the reverse direction, resulting as an adaptation more likely to insure fertilization under the conditions of aquatic life. The second supposition, indeed, seems by no means an unlikely one, and *Ceratomyces*, which is assumed, at least, to produce its sperm-cells in coherent threads, would represent the culmination of this tendency in a modern genus.

Again it may be asked whether the simple antheridium has been derived from the compound, as might be suggested by the conditions seen in *Distichomyces*, or by a reduction to one cell of such a compound antheridium as is found in *Rickia*: or, as seems more probable, has the reverse process actually occurred. Furthermore it is by no means evident whether the unisexual, or the hermaphrodite condition, which are associated with both the simple and compound type of antheridium, is primitive or the reverse. Although the general tendency in upward series appears to be toward a separation of the sperm- and egg-cell-function on different individuals, and this condition has no exceptions in the highest plants, by far the most highly developed and apparently modern genera of Laboulbeniales are hermaphrodite: but if we look for what is absolutely the simplest condition found in this group, we find it without question in the genus *Amorphomyces*, a unisexual type with simple antheridia. And here it may be pointed out that all the forms which grow on Blattidæ, supposed by entomologists to be among the most ancient types of insects, are unisexual, with simple antheridia.

The not uncommon phenomenon already mentioned above, and formerly illustrated in *Laboulbenia inflata*, Monograph, Plate III, fig. 5, which involves the atrophy of one member of the usual spore-pair, may be perhaps significant in this connection; in that it suggests the survival of a tendency to form two kinds of individuals, one of which had become superfluous after the appearance of antheridia on the female individual. This is still more strikingly suggested by instances such as the one illustrated herewith, on Plate XLIX, figs. 16–17, which, although rare in general, are common in this and a few other species. Here one member of the spore-pair, becomes not only a dwarf individual, but is absolutely unisexual, bearing a well developed and normally functional antheridial appendage. Yet here also, the monopolization of food supply by one member of the spore-pair, may have led to a dwarf habit and partial loss of function in the other, and it is not by any means inconceivable that, through gradual loss of its male function by the vegetatively vigorous individual, a unisexual condition might become a fixed phenomenon, in both members.

Since the series may thus be read upward or downward as one prefers, and *Amorphomyces* is quite as likely to illustrate a last step in retrogression as a first in evolution, one may be pardoned, if like the writer he confesses his complete agnosticism in these matters, an agnosticism which embraces the question of the origin of the Ascomycetes as a whole, and the determination of the course of evolution in the entire fungus series: matters which, in recent years, have been too copiously discussed in the rather feeble light of small contributions to the available data. Although it is difficult to believe that the Laboulbeniales, for example, and the Florideæ; that *Monoblepharis insignis* and *Vaucheria intermedia* Nordst; that *Araiospora* and *Dichotomosiphon*; that the Mycochytridineæ, *Rhodochytrium* and *Chlorochytrium* have none of them ever had mutual kin nearer than some primordial protoplasmic entity at the bottom of the plant series and in the early ages of organic life; it is nevertheless foolish, on the basis of our present knowledge, to attempt an arbitrary settlement of the complex phenomena of series among the fungi. As to the Laboulbeniales, it may be said with safety that they resemble the Florideæ in some respects more closely than they do any other plants, while at the same time they are more surely Ascomycetes than many forms included in this group, and the writer sees no sufficient reason why they should not be placed in the Pyrenomycetes, as a group coordinate with the Perisporiales, Hypocreales etc.

KEY TO THE GENERA OF LABOULBENIALES.

In order briefly to summarize the genera thus far described, the following dichotomous key has been prepared which indicates in a general way their supposed natural sequence, as far as this is possible in such a summary, and includes a tentative separation of the more pronounced types which have been designated by special names designed to suggest the conditions of isolation in the various genera or groups of genera. It is not expected that this key will prove useful as a means of determining genera to anyone who has not made himself familiar with the general conditions existing in the group and summarized in the preliminary matter of this and the preceding Monograph. It will be observed that *Distichomyces*, although at maturity it possesses free simple antheridia, is included among the Peyritschiellaceæ, where it rightly belongs, and that also *Hydrophilomyces* is included in the second section, of Ceratomycetineæ, although its supposed antheridial cells are more or less clearly distinguished. The latter are, however, merely corners, as it were, separated from the cells of the main appendage, and later appear to grow out into sterile branches as in *Corcomyces*. *Polyascomyces*, *Smeringomyces* and *Misgomyces*, being of uncertain affinities, and their antheridia being unknown, are assigned merely provisional places in the arrangement.

1.	Antheridia specially differentiated cells or groups of cells.	LABOULBENIINEÆ	80
2.	Antheridia compound, the antheridial cells endogenous, arising from one or more intercalary cells and discharging into and from a common chamber (eventually free in a compact group in *Distichomyces*)	PEYRITSCHIELLACEÆ	35
4.	Individuals unisexual.	**Dimorphomyceteæ**	7
5.	Perithecia arising from a primary vertical or oblique axis.	*Dimeromyces* I. p. 267 II. p. 241	6
6.	Perithecia arising from one or more secondary axes springing from the subbasal cell.	*Dimorphomyces* I. p. 264 II. p. 240	
7.	Individuals hermaphrodite, sterile appendages unicellular, subtended by black constricted septa.		20
8.	Antheridium a free branchlet from the receptacle.	**Rickieæ**	11
9.	Antheridial cells discharging through a common pore.	*Rickia* II. p. 247	10
10.	Antheridial cells becoming free in a compact group.	*Distichomyces* II. p. 248	
11.	Antheridium wholly or partly adnate to the receptacle.	**Peyritschielleæ**	18
12.	Cells of the receptacle in tiers above the basal cell.		
13.	Perithecia wholly free.		16
14.	Subterminal tier of the receptacle bearing paired antheridia.	*Dichomyces* I. p. 282 II. p. 249	15
15.	Subterminal tier bearing a single antheridium at one side.	*Peyritschiella* I. p. 278 II. p. 260	
16.	Perithecia more or less adnate to the distal portion of the receptacle.		
17.	Antheridium anterior at the base of the perithecium.	*Limnaiomyces* II. p. 261	18
18.	Antheridium near base of appendages; two cells superposed above foot.	*Chitonomyces* I. p. 285 II. p. 263	19
19.	Antheridium as in 18, three cells above foot.	*Hydræomyces* I. p. 293	
20.	Individuals hermaphrodite, sterile appendages multicellular, subtended by black constricted septa.	**Enarthromyceteæ** *Enarthromyces* I. p. 276 II. p. 267	21
21.	Individuals hermaphrodite, sterile appendages absent or without black subtending septa.		
22.	Antheridium discharging between four terminal appendiculate cells.	**Monoicomyceteæ**	25

23.	Antheridial cells disposed in four opposite pairs.	*Monoicomyces* II. p. 268	24
24.	Antheridial cells numerous.	*Eumonoicomyces* I. p. 273	
25.	Antheridium opening by a free pore.	**Haplomyceteæ**	
26.	Antheridial cells unassociated with evident sterile cells above the stalk-cell of the appendage.		29
27.	Antheridium terminal, rounded, areolate, with lateral pore and terminal spine.	*Haplomyces* {I. p. 269 II. p. 276	28
28.	Antheridium conical with prominent terminal pore.	*Camptomyces* I. p. 274	
29.	Antheridial cells associated with evident sterile cells above the stalk-cell of the appendage.		
30.	Antheridial cells numerous, disposed in obliquely superposed rows, associated with an external sterile marginal cell, opening terminal.	*Eucantharomyces* I. p. 273 II. p. 275	31
31.	Antheridium opening by a lateral pore below a terminal cellular sterile portion.	*Kleidiomyces* II. p. 280	32
32.	Antheridial cells few, opening into a chamber extending upward beside two external sterile cells to a terminal chamber and pore.	*Euhaplomyces* II. p. 281	33
33.	Antheridium areolate, lateral below sterile terminal branches.	*Cantharomyces* {I. p. 271 II. p. 281	
34.	*Incertæ sedis*, ascogenic cells very numerous. (See 46.)	*Polyascomyces* I. p. 299.	
35.	Antheridia single cells with free efferent tubes.	LABOULBENIACEÆ	
36.	Individuals unisexual.		42
37.	Perithecia on secondary repent receptacles attached to the host.	**Herpomyceteæ** *Herpomyces* II. p. 282	38
38.	Perithecia arising from a primary receptacle.	**Amorphomyceteæ**	
39.	Receptacle two-celled, terminated by the perithecium, spores continuous.	*Amorphomyces* I. p. 295 II. p. 293	40
40.	Receptacle terminated by a two-celled prominence, spores once-septate.	*Dioicomyces* II p. 293	41
41.	Receptacle several-celled, chætophorous. (*Incertæ sedis.*)	*Smeringomyces* II p. 296	
42.	Individuals hermaphrodite. Primary receptacle without secondary elongation through intercalary growth.		75
43.	Receptacle simple, or without free axes of secondary origin.		69
44.	Antheridial appendage a single, simple, specialized series of superposed cells, unassociated with sterile branchlets or appendages.	**Stigmatomyceteæ**	50
45.	Subterminal cell of the appendage sterile, the cell below it bearing several antheridia, the terminal cell bearing a single spinose antheridium.	*Acompsomyces* II p. 297	46
46.	Appendage of several flattened irregularly superposed cells, surmounted by a dome-shaped structure, ascogenic cells very numerous. (*Incertæ sedis*, see 34.)	*Polyascomyces* II. p. 299	47
47.	Antheridial appendage of five cells, two superposed antheridia arising from the terminal and subterminal cells respectively.	*Acallomyces* I. p. 300	48
48.	Distal, fertile, portion of the appendage consisting of two to many superposed cells which give rise to antheridia superposed in a single or double series.	*Stigmatomyces* {I. p. 298 II. p. 301	49
49.	Antheridia more or less distinctly whorled on the fertile terminal portion of the appendage.	*Arthrorhynchus* {I. p. 297 II. p. 312	
50.	Antheridial appendages or branches more than one and associated with sterile branches or branchlets.		

51.	Receptacle appearing to be distally multicellular through proliferation, the resultant cells more or less copiously appendiculate.		58
52.	A primary appendage of superposed cells bearing specialized antheridial branchlets superposed externally, similar branches arising from cells on one side, about the bases of the perithecial stalk-cells.	**Idiomyceteæ** *Idiomyces* I. p. 302 II. p. 314.	53
53.	No primary appendage distinguishable at maturity.		
54.	Receptacle obconical, the proliferous cells producing distally a dense tuft of appendages enveloping the bases of the perithecial stalk-cells.	**Teratomyceteæ**	57
55.	Sterile branches few, antheridial cells intercalary in continuous series.	*Symplectromyces* II. p. 314	56
56.	Sterile branches and branchlets copious, antheridial cells free, externally superposed in irregular series on the lower segments of the appendages and associated with beak-like sterile cells.	*Teratomyces* I. p. 354 II. p. 315.	57
57.	Receptacle subtriangular, flattened, with paired, two-celled rounded outgrowths and paired perithecia, proliferating cells above their bases producing numerous branched appendages.	*Diplomyces* I. p. 357	
58.	Receptacle consisting of two superposed cells, the upper giving rise directly to a more or less well distinguished free main appendage and to one or more free, stalked perithecia.		68
59.	Antheridial branches producing serial intercalary antheridia.	**Corethromyceteæ**	
60.	Primary appendage hyaline producing branches from its basal cell, secondary perithecia originating like the primary.	*Rhadinomyces* I. p. 305 II. p. 317	61
61.	Primary appendage more or less blackened, its basal cell producing secondary perithecia when these occur.	*Corethromyces* I. p. 303 II. p. 318	
62.	Antheridia borne free, singly, or in groups, on the appendage, or on its branches.	**Laboulbenieæ**	
63.	Main axis of the appendage consisting of two superposed cells, the upper bearing a series of branches from the bases of which arise branchlets bearing the antheridia singly or in groups.	*Eucorethromyces* II. p. 320	64
64.	Appendage consisting of several superposed cells, the distal bearing sterile branches, the basal often perithecia, the rest short antheridial branchlets from their upper inner angles.	*Stichomyces* II. p. 321	65
65.	Appendage of numerous superposed cells, the basal free sterile and specially modified, the rest bearing a series of branches superposed externally, the basal cells of which give rise to antheridia singly or in groups.	*Rhizomyces* I. p. 307 II. p. 322	66
66.	Appendage of superposed cells, the basal adnate, sterile unmodified, the rest appendiculate on the inner side, the branchlets bearing antheridia more or less irregularly.	*Sphaleromyces* I. p. 365 II. p. 323	67
67.	Appendage two-celled, the distal cell a blackened insertion-cell bearing sterile and antheridial branchlets.	*Ceraiomyces* II. p. 327	
68.	Receptacle multicellular, the cells subbiseriate above the subbasal cell, the one series terminated by the perithecium, the other by the appendages.	*Laboulbenia* I. p. 308 II. p. 328	
69.	Receptacle producing one or more free secondary perithecigerous axes.		

70.	Primary axis displaced by a single simple more or less elongate multicellular chætophorous secondary axis, bearing a subterminal perithecium.	**Rhachomyceteæ** *Rhachomyces* I. p. 358 II. p. 420	71
71.	Receptacle a biseriate-multicellular peritheeigerous axis, producing laterally similar peritheeigerous axes.	**Clematomyceteæ** *Clematomyces* II. p. 427	72
72.	Peritheeigerous axes unicellular and distally appendiculate below the perithecial stalk-cell.	**Compsomyceteæ**	
73.	Individuals solitary with subverticillate fertile and sterile branches from a primary two-celled receptacle.	*Compsomyces* I. p. 366 II. p. 428	74
74.	Individuals in a dense tuft, with a common intrusive cellular haustorium.	*Moschomyces* I. p. 368 II. p. 429	
75.	Receptacle indeterminate or elongating by secondary cell-division.		
76.	Primary appendage a well defined axis of superposed cells (see also 84).		79
77.	Receptacle and primary appendage forming a bristle-like coincident axis of superposed cells, bearing branches, perithecia and further branches in a unilateral series and in the order mentioned.	**Chætomyceteæ** *Chætomyces* I. p. 364 II. p. 429	78
78.	Receptacle very variable through secondary growth, producing no branches below the perithecium.	**Ecteinomyceteæ** *Ecteinomyces* II. p. 429	
79.	Primary appendage a rounded cellular prominence beside the perithecium, with evanescent terminal branchlets (*incertæ sedis*).	**Misgomyceteæ** *Misgomyces* II. p. 430	
80.	Antheridia more or less undifferentiated cells of the appendages or of their branches. Mostly aquatic.	CERATOMYCETINEÆ	
81.	Receptacle not a massive multicellular structure.		90
82.	Receptacle bearing no appendages below the perithecium.	**Ceratomyceteæ**	89
83.	Receptacle indeterminate.		86
84.	Perithecium determinate, the wall-rows few-celled.	*Hydrophilomyces* II. p. 431	85
85.	Perithecium indeterminate, the wall-rows many-celled.	*Rhynchophoromyces* II. p. 432	
86.	Receptacle determinate.		
87.	Perithecium determinate, wall-rows few-celled.	*Autoicomyces* II. p. 434	88
88.	Perithecium indeterminate, wall-rows many-celled.	*Ceratomyces* I. p. 372. II. p. 435	
89.	Receptacle bearing appendages from specially differentiated cells below the perithecium.	**Coreomyceteæ** *Coreomyces* II. p. 441	
90.	Receptacle a massive multicellular structure.	**Zodiomyceteæ**	
91.	Receptacle distally cup-shaped, a ciliate margin surrounding numerous perithecia.	*Zodiomyces* I. p. 369 II. p. 444	92
92.	Receptacle a massive axis continuous with a terminal appendiculate primary appendage and bearing numerous peritheeia and appendages in a crowded lateral series.	*Euzodiomyces* II. p. 444	93
93.	Receptacle a massive axis continuous with a terminal appendiculate primary appendage, consisting of numerous superposed tiers, the upper of which grow out laterally on either side to form peritheeigerous branches of numerous superposed cells.	*Kainomyces* II. p. 445	

LABOULBENIINEÆ.

Antheridia consisting of specially differentiated cells or group of cells.

PEYRITSCHIELLACEÆ.

Genera monœcious or diœcious, the antheridia "compound," the antheridial cells originally and at maturity (except in *Distichomyces*) opening into a common cavity whence they discharge their sperm-cells through a common pore.

DIMORPHOMYCES Thaxter. I.p.264

This well marked diœcious genus was founded on two New England species, *D.* ~~*infectus*~~ muticus and *D. denticulatus,* and as far as these species are concerned I have nothing to add to my original account except to mention that *D.* ~~*infectus*~~ muticus has been observed on a *Falagria* sent me from Ohio. Both species are no doubt as common elsewhere as they are in New England. The present addition of two species is, in all probability, no reliable index of the numerical importance of the genus, since the hosts appear to be neglected by collectors and are not well represented in the collections examined. The plants themselves, too, are very minute, pale in color, and visible with great difficulty on dried hosts.

In comparing the structure of these forms with that which is characteristic of the simpler types of the family, it is evident that there is a close correspondence in essentials. The primary receptacle in both sexes consists of the usual basal and subbasal cells, and its axis is terminated by a simple primary appendage of two or three superposed cells. The male, except in abnormal individuals which rarely occur, produces a single antheridium which arises directly from the subbasal cell. In the female, however, the conditions are much more complicated, since the perithecia arise from lateral branches, "secondary receptacles," derived from the subbasal cell, which are bordered below by an extension or outgrowth of the basal cell that keeps pace with the development of the secondary receptacle. In the two species originally described two of these receptacles arise, one on either side, which are more or less symmetrical. In the two herewith illustrated, however, but one such receptacle is produced and the individuals are asymmetrical in consequence. The cell relations are clearly seen in *D. Myrmedoniæ,* Plate XXVIII, fig. 15, in which the actual conditions are more readily made out than in the species first described. A reexamination of the latter leaves no doubt as to the essential correspondence of their structure.

As far as I have observed, the sexes are always associated in the spore-pairs in this genus, although, as in other diœcious forms, instances may occur in which they fail to be juxtaposed at the point of attachment to the host.

DIMORPHOMYCES MYRMEDONIÆ Thaxter. Plate XXVIII, figs. 14–16.
Proc. Am. Acad. Arts. and Sci., Vol. XXXV, p. 409. Apr., 1900.

Male individual tinged with smoky brown, relatively small and stout, the neck of the antheridium short, the primary appendage consisting of three superposed cells, the middle one distinguished by slight constrictions and by dark septa, especially below; the terminal one bluntly rounded distally, twice as long as broad; the thick walls above becoming disorganized. Total length to tip of antheridium, including foot, 65 μ; to tip of appendage 40 μ. Antheridium 38 μ in length, the center 25 × 14 μ.

Female individual relatively large, tinged with smoky brown, the primary appendage consisting of three cells; the fertile secondary receptacle developed, almost at right angles to the primary axis, on one side only, and consisting of from five to twelve cells. Perithecia one to five in number, the appendages from three to six, alternating with them, or succeeding one another somewhat irregularly; the two series, perithecia and appendages, somewhat divergent; the subtending cells relatively large and obliquely placed with reference to the bordering extension of the basal cell, so that they appear larger from one side than from the other. Perithecium rather long and slender, nearly straight, stouter and somewhat inflated in small individuals; the tip blunt or nearly truncate, tinged with smoky brown; borne on a short inconspicuous stalk-cell from which it bends abruptly upward. Appendages relatively large, consisting of two superposed cells, constricted at the septa; the basal one longer, distally more deeply suffused; the upper distally suffused, and modified like the corresponding portion of the primary appendage. Spores about 20 × 3 μ. Perithecia, in well developed individuals, 100 × 18 μ. Primary receptacle about 60 μ. Secondary receptacle (larger) 75 μ. Appendages about 58 × 13 μ.

On *Myrmedonia flavicornis* Fauv., Brit. Mus. (Biologia C.) No. 766, Guatemala.

This singular looking plant was found on various parts of the host, especially on the abdomen, and shows considerable variation in the development of the secondary receptacle especially, small forms occurring with a single perithecium only. The accompanying figures represent the most highly developed individuals, and show the tendency to degeneration which affects the tips of both primary and secondary appendages.

DIMORPHOMYCES THLEOPORÆ Thaxter. Plate XXVIII, figs. 12–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 410. Apr., 1900.

Male individual much as in *D. muticus*, the primary appendage ending in a short blackened cell, bluntly rounded or nearly truncate. Total length to tip of antheridium 66 μ, to tip of sterile cell 37 μ.

Female individual. Structure of the receptacle like that of the other species, but only developed on one side of the median sterile portion, or primary appendage, which consists of three cells like that of the male individual and is black tipped. The appendages and perithecia arising as in the other species, the latter nearly symmetrically subfusiform, bluntly rounded at the tip, tinged with smoky brown, the tip undifferentiated, the appendages relatively large and simple. Perithecia (not quite mature) 50 × 14 μ. Foot, to end of lateral portion, 50 μ. Total length to tip of perithecium 80 μ.

On *Thleopora corticalis* Gz., Paris Museum, No. 297, Santa Anna, Madeira. On inferior surface of abdomen.

The material of this species is very scanty and it is impossible to determine the exact appearance of the male individual, since a single specimen, only, is present in the preparations, placed as is shown in fig. 12 at the right. The species is closely allied to the preceding, but differs in the form of the perithecium, as well as in that of the primary and secondary appendages, the disorganization at the tips of the latter causing them to appear truncate.

DIMEROMYCES Thaxter.

XXVIII 1-11 + 17
XXIX.
Part I. p. 247

Eight additional forms of this very peculiar diœcious genus show that, although it is extremely well defined in general, the species present remarkable variations in structure, and, with the exception of *Laboulbenia*, inhabit more diverse hosts than the members of any other genus. With the exception of *Herpomyces*, no other genus has been found on Orthoptera, and three East Indian forms occur on small species of Diptera. Two of these dipterophilous forms, *D. coarctatus* and *D. rhizophorus*, which are very closely allied, are of especial interest; since, although both occur on the integument of the inferior surface of the abdomen of their soft bodied hosts, and thus live under practically identical conditions, the one absorbs its nutriment by a well developed haustorium which penetrates the body-cavity, Plate XXVIII, fig. 7, while the other, fig. 1, is attached by the usual foot and shows no sign of any penetration. It is not improbable that the members of this genus will prove characteristic parasites on *Forficulæ* generally, as are the species of *Herpomyces* on Blattidæ.

Of *D. Africanus*, illustrated in my Monograph, I have examined additional material from Cape Coast Castle, Africa, on *Pachyteles*, in the Hope Collection No. 287.

DIMEROMYCES MINUTISSIMUS Thaxter. Plate XXIX, figs. 6–9.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 304. July, 1905.

Male individual. Receptacle consisting of three cells, the basal externally suffused with blackish brown, and projecting beneath the base of the antheridium; the subbasal giving rise to the solitary antheridium; while the distal is separated by a blackened septum from a two-celled erect rigid distally spinose appendage. Venter of antheridium small, tapering gradually to the stout outcurved neck. Total length, including foot, 32 μ. Antheridium 16 × 5 μ.

Female individual. Receptacle very irregularly formed, externally blackened above the large foot; consisting of several irregularly superposed cells, the subbasal giving rise to a two-celled prominence subtending a blackish tapering appendage, which projects at right angles to the colorless primary appendage; the latter two-celled, distinguished by a blackish septum, and often subtended by a similar appendage from the same (distal) cell of the receptacle. The single perithecium rather short and broad, tapering slightly to the more or less distinctly differentiated somewhat truncate tip. Length to tip of perithecium 50 μ. Longest appendage 40–50 μ. Perithecium 34 × 10 μ.

On the inferior surface of the rhabdites of *Labia minor* Burm., Cambridge, Mass.

This and the preceding species may prove merely variations of the same form due to the differences in their position of growth, and are only provisionally separated. *M. Labiæ* is much less common than the present species and has only been seen on the elytra. *M. minutissimus* occurs not uncommonly on the rhabdites, but is very difficult to find and to remove, from its minute size, dark color and appressed habit of growth. Both species are most nearly allied to *M. Forficulæ*, although abundantly distinct from it.

DIMEROMYCES LABIÆ Thaxter. Plate XXIX, figs. 1–5.

Proc. Am. Acad. Arts and Sci., Vol. LXI, p. 303. July, 1905.

Male individual. Receptacle consisting normally of three superposed cells, the basal projecting laterally to form the base of the lowest antheridium, bearing distally a two-celled appendage distinguished by a basal blackish septum; the two upper cells of the receptacle producing two, rarely three, antheridia: the latter short and stout, the efferent region containing the several tubes rather abruptly distinguished from the venter, as well as from the common efferent tube, which curves outward somewhat abruptly. Total length to tip of appendage, including foot, 50 μ. Appendage 25 μ. Antheridium 16–18 × 6–7 μ.

Female individual. Subhyaline, or straw-colored, consisting of an irregular axis of three or four superposed cells, terminated by a simple, usually two-celled, appendage distinguished by a blackish septum; the subbasal cell bearing a broad blunt bicellular upcurved appendage or protrusion, which subtends either the single perithecium, or a several-celled appendage similar to the primary one. Perithecium solitary, colorless, somewhat elongate, tapering but slightly to the more or less abruptly distinguished rather broad somewhat flattened tip. Total length of tip of perithecium 65–75 μ. Perithecium 50–60 × 12 μ. Spores about 18 × 12 μ.

On the elytra of *Labia minor* Burm., Cambridge, Mass.

As has been already mentioned, this species is very closely related to *D. minutissimus* of which it may prove a mere variety due to its position of growth. The material is not abundant, but the differences indicated in the figures and descriptions appear to be constant, even the greater number of antheridia in the male individuals. The host is a small *Forficula* common in refuse, especially in the Fresh Pond region.

DIMEROMYCES FORFICULÆ Thaxter. Plate XXVIII, figs. 9–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 9. June, 1902.

Male individual. Receptacle consisting of three superposed cells, the upper distinguished by a well-defined black septum from a short two- to three-celled terminal appendage, the subbasal septum of which is also blackened; the subbasal cell of the receptacle producing a suberect, short-stalked, rather long and narrow antheridium; the neck relatively broad, blunt, about as long as the stalk and venter. Total length to tip of antheridium 60 μ: the antheridium, including stalk, 28–30 × 7–8 μ.

Female individual more or less tinged with purplish-brown, especially the body of the perithecium. Receptacle consisting of usually five cells obliquely superposed, with the exception of the uppermost, successively smaller from below upward, the series more or less strongly curved outward from the male; the subbasal cell bearing a simple differentiated appendage, its basal cell more or less geniculate and separated from the basally inflated, tapering, brown, five- to six-celled distal portion by a blackish constriction; the cell next above it producing the single perithecium; the next a simple cylindrical slightly tapering appendage with a black subbasal constricted septum; the terminal cell bearing terminally a short, simple, few-celled primary appendage, distinguished by a constricted black basal and a pale subbasal septum, and laterally a similar appendage distinguished by a subbasal blackish constricted septum. Perithecium rather elongate, subclavate or subfusoid, the stalk not distinguished from the body of the perithecium, and sometimes showing irregular septa; the tip often somewhat abruptly distinguished, blunt, slightly asymmetrical. Spores about 35 × 3.5 μ. Perithecia, including stalk, 90–110 × 18–22 μ. Longest appendage 80 μ. Receptacle 60–70 μ. Total length to tip of perithecium 150–185 μ.

On all parts of *Forficula tæniata* Dohrn.; Mus. Comp. Zoöl., No. 1355; Guatemala.

A species most nearly related to the other forms on earwigs, but clearly distinguished by numerous points of difference in both sexes.

DIMEROMYCES RHIZOPHORUS Thaxter. Plate XXVIII, Figs. 6–8.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 412. March, 1901.

Male Individual. Receptacle consisting of a basal cell, which penetrates the host directly without a differentiated foot by means of a simple rhizoid, and of two to three superposed cells above it, each of which usually bears an antheridium, the upper terminated by a short, pointed, slender cell. The antheridia rather short and stout, with short, stout necks. Receptacle about 50 × 8 μ. Appendage 12 × 3.5 μ. Antheridia 25 × 9 μ.

Female Individual. More or less deeply tinged with amber-brown. Receptacle amber-brown, consisting of six superposed cells, the small basal cell, hardly visible above the integument, penetrates the host directly by means of a very large, abruptly furcate rhizoid, the two cells above it similar, broader than long, bearing each an appendage consisting of a basal cell bent toward the receptacle, darker and narrower distally, and separated by a dark septum from the three-celled terminal portion, which is straight or slightly curved, larger toward the middle, the smaller terminal cell becoming partly disorganized. The next (fourth) cell of the receptacle bears the single perithecium; the distal terminal cell longer and narrower, and terminated by a short, pointed, one- sometimes two-celled primary appendage (similar to that of the male individual), from which it is separated by a constriction; the subterminal cell narrower distally, producing on its inner side an appendage similar to those below it, but straight and somewhat shorter. Perithecium with a short stout stalk rapidly expanding into the asymmetrically inflated deeper brown venter of the perithecium; the neck very short and abruptly distinguished; the tip relatively large, four-lobed, inflated with two lateral papillate outgrowths, above which the lips form a subconical projection. Spores about 25 × 3 μ. Perithecium including stalk 70–90 × 20–25 μ. Receptacle about 45 × 12 μ. Primary appendage 12 μ; secondary appendages 35–40 μ. Penetrating rhizoidal branches 150–184 × 10–12 μ. Total length to tip of perithecium 90–110 μ.

On the inferior surface of the abdomen of a small fly. Ralum, New Pomerania. Berlin Museum, No. 1295.

This form is distinguished from all other described species of the genus by the presence of penetrating rhizoids which replace the normal blackened foot. In the female they appear to be regularly once furcate immediately below the integument, the two branches diverging so that the individual cannot be detached without breaking one or both of them. The male, however, develops merely the simple rhizoid, shown in fig. 8, a slight swelling immediately below the integument serving to hold it with sufficient firmness.

DIMEROMYCES COARCTATUS Thaxter. Plate XXVIII, Figs. 1–5 and 17.
Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 410. March, 1901.

Male Individual. Receptacle nearly hyaline, consisting of usually three superposed cells, the upper separated by a dark-colored constriction from a short, simple, two- to three-celled hyaline or brownish appendage. The antheridia usually two, seldom three, borne singly from the successive cells of the receptacle, from which they are separated by a small basal cell; the venter having an external depression and not abruptly distinguished from the stout curved neck. Receptacle 35–45 × 6–7 μ. Appendage 25–50 μ. Antheridia 18 × 5 μ.

Female Individual. Receptacle consisting of a large basal cell about twice as long as broad, bulging so as to form a rounded base which pushes the small brownish-black foot to a lateral or sublateral position; the remaining cells, usually eight or nine in number, separated by horizontal septa and superposed in a simple series; the lower cells greatly flattened, those above somewhat less so, the series ending in a somewhat abruptly narrower terminal cell, which is more than twice as long as broad, subcylindrical, its extremity rounded symmetrically and bearing a short, simple, usually four-celled terminal brownish appendage, which is distinguished by a constricted dark basal septum, and terminated by a somewhat inflated lighter larger cell, which becomes characteristically disorganized on one side, so that the appendage appears to end in a slender curved projection. The remaining cells of the receptacle producing single appendages or perithecia, except the basal and sometimes a subbasal cell. The uppermost of these secondary appendages arises from the inner side of the subconical subterminal cell of the receptacle, occupying a position in the median line between the primary appendage and the base of the first perithecium, and consists of a short subconical basal cell, from the narrow extremity of which the simple, several-celled terminal portion is distinguished by a constricted dark septum; the remaining appendages laterally divergent on opposite sides in such a way as to appear paired, usually three on each side, each consisting of a rather long basal cell inflated along its upper side so as to appear more or less geniculate, concolorous with the receptacle, its narrower extremity suffused with dark brown, distinguished without constriction by a dark septum from the simple terminal portion, which is usually five-celled, more or less strongly recurved, brown, its terminal cell becoming inflated and undergoing gelatinous degeneration on the lower side, which causes it to appear split in two, the hook-like upper half of the cell alone persisting in some individuals. Perithecia yellowish, distally brownish, one, rarely two, in number; the first always arising from the cell immediately below that which bears the upper secondary appendage, the second, when one is present, replacing one of the appendages lower down; consisting of a symmetrically inflated venter, which tapers gradually downward, passing into the short stalk; a short neck rather abruptly distinguished, deeper brown below, its tip inflated below four terminal projections, three or two of which are in the form of rounded papillæ of unequal size, and one or two of which are pointed and much more prominent. Spores 42 × 3.5 μ. Perithecium, including the stalk, which is continuous with it, 125 × 20–35 μ. Receptacle to base of primary appendage 50–75 μ. Secondary appendages about 75 μ. Total length to tip of perithecium 150–180 μ.

Densely crowded on the inferior surface of the abdomen or rarely on the legs of a small pale fly. Ralum, New Pomerania. Berlin Museum, No. 1282.

Abundant material of this species has been examined and although it grows on the soft inferior abdominal integument of a similar host and in the same position, it shows no tendency to develop the haustoria which are so characteristic of the preceding species. The two are very closely allied, nevertheless, the form and disposition of the appendages, which project something like the legs of a crustacean, affording the most striking points of difference. The individuals usually occur crowded in large numbers on the abdomen of the host, and eventually are very evidently injurious in their effects, causing the abdomen to become brown and more or less shriveled. I know of no other instance in which an evident injury results from the parasitism of any member of the group. In both species the sexes are apt to become separated or irregularly disposed, although their occurrence in pairs is a normal condition.

DIMEROMYCES CRISPATUS Thaxter. Plate XXIX, Figs. 14–15.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 413. March, 1901.

Male Individual. Receptacle consisting of four superposed hyaline cells, the basal one much longer than the rest combined; the upper bearing distally a two-celled terminal appendage, the lower cell of which is small, the upper elongate, brownish; the two remaining cells of the receptacle producing each a single antheridium. Antheridia superposed, the stalk-cell, neck, and venter well distinguished, the latter symmetrically and considerably inflated, the neck slightly curved. Receptacle 50 × 8 μ. Antheridia 33 × 8–9 μ. Appendage 36 μ.

Female Individual. Receptacle consisting of usually five superposed cells, the basal cell very elongate, slender, and hyaline; while of the four remaining cells the two lower are much flattened, broader than long, and separated by oblique septa, the two upper unlike and narrower. Of these four cells the second from below gives rise to the stalk-cell of the perithecium, while the others by successive proliferation produce each a branch consisting of eight or ten obliquely superposed cells; while each of these cells in turn produces a single simple branchlet from its upper side, originally terminal, but becoming lateral through the further proliferation of the cell which bears it; the branchlets distinguished by a slight constriction and a broad dark septum at the base, brown, curved, distally helicoid, slightly enlarged and paler. The primary terminal appendage thus appears as the lowest of the upper series of branchlets, from which it does not differ in structure. Perithecia one to three in number, the first lowest, and always formed from the second from below of the four distal cells of the receptacle, others sometimes arising from each of the two upper distal cells; the stalk hyaline, long and slender, the venter small, narrow, not distinguished from the stalk, becoming brownish, distally slightly inflated, the neck short and well but not abruptly distinguished; the tip well differentiated, hyaline, symmetrical or nearly so, shovel-shaped or spathulate, swollen at its base, and tapering to the broad, bluntly rounded or nearly truncate apex. Spores about 30 × 3.5 μ. Perithecium: 70–75 × 18 μ, the stalk 50–125 × 15 μ. Receptacle basal cell 185–250 × 18 μ, the distal portion about 50 μ. Total length to tip of perithecium 360–435 μ. Lateral cell-series or branches about 50 μ long, their branchlets to tip of helix about 50 μ.

On the legs and superior surface of the abdomen of the same host parasitized by *D. coarctatus.* Ralum, New Pomerania. Berlin Museum, No. 1282.

This species occurred very rarely and always in solitary pairs on various parts of the host, no instance being observed in which a male failed to develop at the base of the female. It is more highly differentiated than any of the other species in that the upper cells of the receptacle proliferate to form several appendiculate branches. The species is further well distinguished by its curled appendages, elongate basal cell, and peculiar long-stalked perithecia.

DIMEROMYCES NANOMASCULUS Thaxter. Plate XXIX, Figs. 10–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 411. April, 1900.

Male individual very minute, consisting of three superposed cells, the upper bearing a terminal two-celled appendage with dark septa, the subbasal cell giving rise to a single small antheridium, the neck usually abruptly turned to one side. Total length to tip of appendage 35 μ; the antheridium about 15 × 5 μ.

Female individual consisting of a main axis of superposed cells from which appendiculate cells are separated on both sides, the basal cell large and long, narrower below; the cells above about ten to fifteen in number, usually roundish; the appendages borne side by side in pairs on both sides of the receptacle, mostly five-celled above their basal cells, sometimes curved or almost hooked distally, variably suffused with brown, the septa dark, the distal cell not conspicuously enlarged, becoming brownish; the subterminal cell of the single terminal appendage examined, producing a blackish-brown, lateral, irregular, spine-like outgrowth. Peritheeium straight, more commonly solitary brownish yellow to dark brown near the tip, not at all distinguished from the stalk, which is hyaline only at its narrow base, the hyaline tip abruptly distinguished by a slight subtending ridge, its margins usually converging symmetrically to the truncate, or blunt apex. Spores about 45 × 3 μ. Perithecia, including stalk, 100–120 × 20–24 μ. Appendages longer 60 × 6 μ. Total length to tip of perithecium 245–285 × about 22 μ.

On *Ardistomis viridis* Say, Cocoanut Grove, Florida. November. On *A. educta* Bates, British Museum (Biologia Collection), No. 676.

The carabid hosts on which this form was found were collected under cocoanut palms along the margin of Biscayne Bay. The species was seldom met with, and the male and female were associated in every case; although, from the very minute size of the former, it is difficult to distinguish and successfully remove it. The appendages are so closely approximated in pairs that they appear at first sight to form a single row, only, on either side; and the presence of a second set below can only be determined by very careful examination. Both this and the succeeding species represent a section of the genus marked by a highly developed erect central axis, which results from intercalary growth, new cells being added apparently as a result of the activities of the basal cell.

DIMEROMYCES PINNATUS Thaxter. Plate XXIX, Figs. 16–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 410. April, 1900.

Male individual consisting of a basal cell more than twice as long as broad, the axis above of eight or nine cells separated by horizontal septa, all but the lowest and the terminal cell separating a small cell on one side which forms the base of an antheridium or of a sterile appendage, the two organs diverging slightly from one another so as to form two vertical rows. Antheridium compound, short and stout, the venter abruptly distinguished from the stout neck, the base of which is slightly enlarged and purplish brown, the distal part tapering very slightly, the apex blunt. Appendages consisting typically of six cells, including the basal cell, constricted at the dark septa, the distal cells suffused with brownish, the terminal one larger, longer, and more or less vesicular, the thick walls tending to gelatinous degeneration. Total length of receptacle 100 × 12 μ. Antheridia 35 × 12 μ. Appendages 50 × 7 μ.

Female individual. Basal cell large and stout, the cells above it about twenty in number, greatly flattened, the septa horizontal, a few of the lower cells having appendages on only one side, or none, the rest bearing them on both sides. Appendages simple, consisting of from five to seven cells including the basal cell, constricted at the dark septa, the terminal cell hyaline and much larger, as in the male; the rest, except the basal one, purplish, or the upper one tinged with brown. Perithecia one to three in number, mostly rather slender, slightly curved outward; the stalk-portion about half as long as the remainder, which is purplish brown, deeper distally; the tip well distinguished when not distended by spores, consisting of a basal portion larger and slightly inflated, and a distal one formed by the lip-cells, abruptly distinguished, its external margins generally symmetrically divergent, the four cells nearly equal and symmetrical and ending distally in a corresponding number of papillæ about the pore. Perithecia including stalk, 125 × 20 μ. Receptacle 190–225 × 28 μ, not including basal cells of appendages. Appendages 55 × 8 μ.

On *Ardistomis* (?) sp., Hope Collection, No. 296. No locality, but probably Mexico or South America. At base of elytra and on leg.

The determination of the host of this species is uncertain, but the insect is at least allied to *Ardistomis*, The parasite is very peculiar and striking in appearance, and although closely allied to the preceding species, differs markedly in the characters of the male, as well as in the arrangement and appearance of the appendages and perithecia. Specimens occurring on the leg of the host (fig. 17), differ decidedly in the form of the appendages and perithecia, the former being longer and more slender, with more numerous septa, and the latter lacking the subterminal elevation, a condition which may, however, be due to immaturity.

RICKIA Cavara.

XXXIV- 1-13

Receptacle consisting of a single basal cell surmounted by a cellular portion, the cells of which are arranged in general in three vertical series: a *posterior* series each cell of which may cut off externally one or two small cells bearing secondary sterile appendages or antheridia, and which is terminated by a single primary appendage borne on a two-celled base: an *anterior* series similar to the posterior, but terminating in a perithecium, and a *median* series ending opposite the base of the primary appendage and extending downward to the basal cells of the other two series. Antheridia irregularly disposed, the numbers varying in different individuals, wholly free, subtended by a blackened septum, flask-shaped, compound. Appendages as in *Peyritschiella*. Perithecium normally solitary.

This genus, which bears a superficial resemblance to *Peyritschiella,* is clearly distinguished by its free compound antheridia which, in general form and appearance, so closely resemble simple antheridia that they were so described by Cavara. Stained preparations, however, show clearly that the antheridium consists of a basal cell, immediately above the blackened septum, and that from this basal cell a small number of antheridial cells arise, discharging together through the common neck. The antheridial cells are very small, and I have been unable to make out their disposition more exactly than is shown in Plate XXXIV, figs. 12 and 13. The structure and development of the receptacle is peculiar and in the material examined, which was obtained partly through the courtesy of Prof. Cavara and partly from the specimens distributed by Rehm, does not correspond to the figures which accompany the original description in Malpighia. The basal cell constitutes a stalk-cell, which may rarely be once-septate, as in fig. 8; but is usually single. Above this, in the youngest individuals (fig. 1), a subbasal cell is distinguished; above this two small superposed cells (fig. 4 w), one of which may be exceptionally absent, form the base of a terminal simple primary appendage (fig. 4 v), distinguished by the usual blackened septum. This appendage, with its two basal cells, develops no further, and is carried upward, without change of form or structure, by the further growth of the receptacle, which results wholly from the activities of the subbasal cell and its products. In the next stage, the subbasal cell is divided by an oblique septum, connecting its two opposite angles. The two cells thus formed may be conveniently distinguished as anterior (on the perithecial side) and posterior. In the third stage (fig. 2) the conditions are similar to those of the second, except that the posterior cell (at the right of y) has become divided to an upper (o) and a lower (z) cell by a transverse septum. The lower of these two cells (fig. 3 z), then begins to grow outward distally, to form later the first secondary appendage, which may or may not be associated with a first antheridium as in fig. 11, at right. In the next stage (fig. 4), the upper (o) of the two cells which have resulted from the division of the posterior cell, divides into two cells by a longitudinal septum and the remainder of the receptacle results from the activity of these two cells together with that of the original anterior cell (y) at the right in fig. 4, which has, as yet, only elongated. Of these three cells, the anterior (y) produces the anterior, or perithecial series of the receptacle, with its secondary appendages and antheridia; the posterior (x) produces the posterior series with its antheridia and secondary appendages; while the middle cell produces the middle or axial series. The further development of these series will be made sufficiently clear by an examination of the successive figures, if it is remembered that figs. 1, 3, 4, 7 and 10 are drawn with the anterior side at the right; while in the remaining figures it lies at the left. The activity of the three cells just referred to, (x) and (y), with the cell lying between them in fig. 4, results from the separation of a terminal cell from each, which, acting as a scheitel-cell, continues to cut off cells below, which, in the anterior and posterior series, become secondarily divided to produce the small cells on which the antheridia and secondary appendages are inserted. While the anterior and posterior series are morphologically branches, and their growth a terminal growth, the central axis is strictly intercalary in its origin, and its development may be compared to the trichothallic growth of certain algæ.

Although from his observations on the relation of this parasite to its host, Cavara appears to be inclined to regard the Laboulbeniales generally as saprophytes, the occurrence of a number of rhizoidal forms seems to render it quite certain that they feed on the juices of the insect which in this, as in a majority of cases, are absorbed, without penetration, through the sucker-like foot.

The genus is closely allied to the succeeding one, from which it differs especially in the possession of an antheridium which is compound at maturity.

RICKIA WASMANNI Cavara. Plate XXXIV, figs. 1–13.

Cavara: Malpighia, Vol. XIII, p. 182, Pl. VI, 1899. Thaxter: Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 39. Rick: Oester. Bot. Zeitschr., April, 1903, p. 163, with figure. Exsic., Rehm Ascomyceten, No. 1451.

Basal cell about as long as, or longer than, the rest of the receptacle; the axial series of cells, extending to a point nearly opposite the middle of the perithecium; consisting of about six cells, more or less; its lowest cell lying above the basal cells of the other two series: the anterior series consisting of from four to five cells, the two lower longer, the lowest only occasionally appendiculate; the posterior series consisting of usually five or six cells, exclusive of the two (rarely single) basal cells of the primary appendage which terminates this series. The members of both the anterior and posterior series, with the usual exception of the basal cell of the anterior series, cutting off a smaller cell distally and externally, which usually cuts off a second small cell; each of these bearing either sterile appendages or antheridia. Antheridia relatively small, flask-shaped, the venters evenly inflated and evenly curved to the narrow necks which are about half as long as the venters. Secondary and primary appendages hyaline, or suffused with brown, simple, mostly inflated, short. Perithecium somewhat asymmetrical, its outer margin and distal half tapering to the somewhat irregular blunt, or truncate, hardly differentiated tip. Perithecium 40–50 × 18–22 μ. Spores 28 × 2.5 μ. Total length to tip of perithecium, average 150 μ, maximum 200 μ. Antheridia about 12 × 4 μ.

On all parts of *Myrmeca lævinodes* Nyl. Linz on the Rhine. (Wassmann.)

This species is said to be abundant in the localities where it has been found, parasitizing a majority of the individuals in certain nests of its host. I have thus far been unsuccessful in attempting to find it in this country, where it seems to be replaced by the curious little *Laboulbenia Formicarum.* In exceptional cases, especially when the primary perithecium has been destroyed, or has failed to develop, secondary perithecia may arise from one or more cells of the receptacle below, as is the case in *Peyritschiella* and in other genera.

DISTICHOMYCES Thaxter. XXXI 1-6

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 308. July, 1905.

Receptacle consisting of a basal and subbasal cell, surmounted by two parallel series of cells of indefinite number, any of which may bear either a sterile appendage, or an antheridium, externally; one of the series ending in a perithecium, the other terminated by the primary appendage. Appendages of the same type as those of *Rickia* and *Peyritschiella.* Antheridia at maturity terminal on a unicellular branch, becoming quite free in a compact group.

This genus is distinguished from *Rickia* by its ultimately free antheridial cells which are apparently developed originally as in the typical compound antheridium. The terminal cell which would ordinarily form the common efferent tube ~~being~~ is absorbed, or disorganized, so that the antheridial cells appear to be quite free, as in the Laboulbeniineæ, and of the same simple type, closely associated in a compact terminal group. The very early development of the antheridium has not been seen in any of the specimens examined, but the occurrence of a disorganization, like that described, seems clearly indicated by the general appearance of the nearly mature antheridial branch, especially by the ridge which is present below the antheridia, Plate LXXI, fig. 5. If this interpretation of the conditions is correct, the basal cell, from which, as in other compound antheridia, the antheridial cells arise as endogenous branchlets proliferating into the terminal cell, by its enlargement and elongation pushes the group of antheridia through the terminal cell, which is destroyed during the process. The development of the receptacle is almost exactly that of *Rickia*, except that the cell (o) of fig. 3, Plate XXXIV, is not divided longitudinally, but as a result of transverse divisions, develops, like cell (x) of fig. 4, to form the posterior series of the receptacle, the median series of *Rickia* not developing at all.

The genus has an especial interest as suggesting that the simple antheridium may possibly have arisen from the compound, rather than that the reverse has taken place, and as indicating the method by which this may have been affected. Yet it should not be regarded as in the least proving that the evolution of the antheridium in the family has not in general been from the simple to the compound type.

DISTICHOMYCES LEPTOCHIRI Thaxter. Plate LXXI, figs. 1–6.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 308. July, 1905.

Slender and considerably elongated, or sometimes short and stout: the primary axis consisting of from twelve to thirty cells, more or less, above the subbasal cell of the receptacle, somewhat proliferous distally beyond the base of the primary appendage, the small cells thus formed, one or two of them appendiculate, extending to the free tip of the perithecium; the perithecial axis consisting of from six to twenty-six cells, more or less; the perithecium slightly broader, but not distinguished from the axis, wholly united on its inner side to the primary axis, more or less strongly curved outward to its blunt subtruncate free tip. Appendages as in *Peyritschiella*, hyaline, rather slender, very variably developed, borne on a small triangular cell, separated distally and externally from the cells of the axis; sometimes numerous, often few and scattered, or almost wanting except distally, where all the cells of the primary axis are usually appendiculate. Antheridial branches borne like the sterile branches, irregular in position and number, sometimes even absent, usually confined to the lower half of the axis, more often near the base, consisting of a short stalk-cell bearing terminally a compact erect group of flask-shaped antheridia, usually four or five in number, their short broad necks at first closely approximated or coherent, divergent only after full maturity. Perithecium 50–55 × 15–20 μ. Longer sterile appendages 75 × 6 μ. Antheridial branch, including antheridia, 18 μ. Total length, longer 475 × 10 μ, shorter and stouter 125 × 36 μ. Secondary perithecia may develop from cells of either axis if the primary perithecium does not develop or is destroyed.

On the head, antennæ and under surface of *Leptochirus* sp., Java; Rouyer, No. 1403.

This species shows very considerable variation in its general habit and in the distribution of its appendages and antheridia, as is indicated by the accompanying figures. As usually happens, individuals which occur on the legs, or in other exposed positions, are commonly short and stout; while those on the thorax or abdomen are characteristically elongate. On account of its small size and pale color it is detected with great difficulty.

DICHOMYCES Thaxter.

Part I. p. 282

XXX 1–7
XXXI – XXXIII.

This genus, of which only three representatives were included in my Monograph, has proved one of the larger genera of the family, including over twenty species of varied habit, although the general type is remarkably constant. The species appear to be very sensitive to unfavorable conditions, and one can usually be sure of finding typically developed individuals only on the body or elytra of the host, those developed on the appendages being, in general, malformed and continually reverting to the *Peyritschiella*-condition; losing the bilateral symmetry of the receptacle, which is constant in well developed individuals of all species, and possessing but a single antheridium. Such a form of *D. inaequalis* was formerly described as a new species of *Peyritschiella*, *P. nigrescens*, but is undoubtedly a reversion of this nature. Since *Dichomyces* must be considered merely as an elaboration of *Peyritschiella*, this reversion to a more primitive structure may be compared, perhaps, to the reversions due to wounds or injuries so often seen in the higher plants. Despite this very common occurrence of *Peyritschiella*-forms in probably all the species of *Dichomyces,* I consider the genus well distinguished by its normally symmetrical receptacle and paired antheridia, this condition occurring in *Peyritschiella* only in exceptional individuals if at all.

The most striking variation which one finds in the species of *Dichomyces* is connected with the presence or absence of the two characteristic "auricles" which surmount the tips of the perithecia in certain cases. Although, the presence or absence of such peculiar structures might well be assumed to indicate a specific difference, it is evident that, in some cases at least, there is a dimorphism in this respect; the auricled form being usually smaller than the other, and even occasionally associated with it on the same individual, as in *D. hybridus,* Plate XXXI, fig. 16. More often, however, as in *D. biformis,* the two are always separated on distinct individuals, as is shown in Plate XXXIII, fig. 1–3. This circumstance renders the separation of the species a matter of considerable difficulty in many cases. For example *D. vulgatus* is an auricled form occurring all over the world on various *Philonthi,* and is associated not infrequently on the same insect with a variety having no auricles. This variety may be almost, if not absolutely, identical in appearance with the typical *D. princeps,* a species which is very common and widely distributed on similar hosts, but which I have not found associated with individuals of an auricled type in its typical condition, although it is not infrequently found covering the host in great numbers. The existence of this dimorphism, however, may render necessary the union of these and possibly other forms, although at the present moment I am inclined to consider them distinct.

The antheridium in this genus, from its position and the usually dark color of the adjacent cells, is not easily examined; but its structure is evidently like that of most compound antheridia; the antheridial cells being seemingly proliferations from a subterminal cell into a terminal cell, which serves as a receptacle for the antherozoids as they are formed, and as a common medium of discharge. These conditions are indicated in a general way in fig. 4, Plate XXXII, but no form has been examined in which more than a very general idea of the cell-arrangement could be obtained.

The species of the genus are confined to hosts belonging to the Staphylinidæ, and are especially common on members of the large genus *Philonthus,* some of them being more or less general parasites on these insects, while others appear to be somewhat definitely restricted in the matter of hosts. That numerous species exist in addition to those below enumerated cannot be doubted.

If one disregards the tendency, above referred to, to revert to a *Peyritschiella*-like condition, the genus is more constant in its characters than almost any other, the only variation of importance being associated with those forms in which the symmetry is lost through the production of a single perithecium, as in *D. Javanus,* Plate XXXII, figs. 1–2. It should be mentioned, however, that in some abnormally developed forms, or where the primary perithecia have aborted through injury or otherwise, secondary perithecia may develop from one or both of the two lower tiers, Plate XXXI, fig. 9, a condition seen occasionally in *Peyritschiella.* As may be seen by an examination of the accompanying Plates, the members of this genus, from their symmetrical form and bizarre outline and coloring, are among the most remarkable and striking members of the group. The scale-like habit and appressed growth are striking illustrations of adjustment to their conditions of life on the surface of swiftly running hosts.

DICHOMYCES FURCIFERUS Thaxter.

This species, which may be regarded as the type of the genus, occurs on small *Philonthi,* and is common in New England. Typical specimens were obtained in the British Museum on *P. albipes* Grav. from Tillsgate, England, and from *P. centralis* Sharp, from Las Mercedes, Mexico? Nos. 364 and 752 respectively. It was also found on *P. discoideus* Grav. from Scotland in Dr. Sharp's collection, No. 1212, and it has been obtained in abundance about Fresh Pond, Cambridge. Forms which appear very closely related, if not identical, but varying in minor respects, have also been examined on small *Philonthi* from

Ceylon, British Museum, Nos. 377–378: on *P. rectangulus* Sharp from Japan, Sharp Coll., Nos. 1123 and 1131.

The Scottish and Japanese specimens, as well as many of those from Fresh Pond, were associated with a second form similar in size and general appearance, except that the fork-like projections were less prominent, or undeveloped, and that the perithecia were relatively larger and without the characteristic auricles. This same form without auricles has also been found repeatedly, unaccompanied by the auricled form, on hosts from Fresh Pond, and has also been examined from the following sources: on *P. cinctipennis* Fauv., Sharp Coll., No. 1173; and on *P. discoideus* from the Canaries, British Museum, No. 404; as well as on *Philonthus* sp., No. 493, from Balthazar, Grenada, West Indies. Variations of this simpler form are illustrated in Figs. 10–12, Plate XXXI, and although I was at first inclined to consider it distinct from both *D. furciferus* and *D. Cafianus*, to which it is too closely allied, I have concluded to designate it, provisionally at least, as a variety of the former, in view of the dimorphism which certainly occurs in various other species of the genus. Of the figures in the accompanying plate, fig. 12 represents the largest individual seen, and is taken from the Abyssinian material, while the two others were collected about Fresh Pond. Other variations occur which resemble *D. furciferus* more closely in showing a more marked development of the fork-like projections of the middle tier.

Dichomyces Belonuchi Thaxter. Plate XXXIII, figs. 6–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 27. June, 1901.

Receptacle relatively large and long: the distal tier relatively small, consisting of from eleven to thirteen short cells, slightly suffused, the median cells little longer than the rest, the series forming slight, rounded, sometimes almost obsolete lateral projections on either side of the perithecia: the basal cell small, partly transparent: the lower and middle tiers not distinguished, uniformly opaque; a portion of the middle cell, and sometimes the tips of other cells in the middle tier, more or less translucent, the marginal cells ending in a light rounded prominence below the base of the antheridium. Perithecia normally two, evenly suffused with pale reddish brown, rather long and slender, tapering throughout, the conformation of the lip-cells much as in *D. furciferus*. Spores about 30 × 3 μ. Perithecia 75–80 × 18–20 μ. Receptacle 108–126 × 54–58 μ. Total length to tips of perithecia 185–200 μ.

On the abdomen of *Belonuchus fuscipes* Fauvel. New Guinea. Sharp collection, No. 1090.

This species is most nearly allied to *D. furciferus*, from which it is distinguished by its longer more slender perithecia, and the almost complete opacity of the two lower tiers, the middle one producing inconspicuous rounded projections in place of the long fork-like outgrowths characteristic of its ally.

Dichomyces vulgatus Thaxter. Plate XXXI, figs. 5–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 424. April, 1900.

Receptacle variable, typically short and stout, the basal cell small squarish hyaline; the lower tier externally opaque, except the whole or the middle of the median cell, or only its upper end, the opaque margin divergent, extending above the base of the second tier, the blackened margin of which is continuous with that of the first tier; sometimes, like it, divergent, more often abruptly less divergent or even erect, extending upward to form on either side free fork-like, usually opaque, sometimes hyaline projections which may extend to a point somewhat above the middle of the perithecia or may be almost obsolete; the three middle cells of the middle tier usually more or less conspicuously punctate below, with transversely elongated blackish brown spots: the antheridia normally placed, unusually long and large, pointed, with two or three short, inconspicuous normal appendages placed one behind, the rest external to it. The upper tier distally concave, consisting of from fifteen to twenty-one cells, producing normally four sometimes two perithecia associated, as usual, with short stout typical appendages. Perithecia erect or slightly divergent, straight, dimorphic: stouter and longer, and ending in a single blunt tip; or rather short and stout, pale reddish amber-brown, the lower half or third often abruptly lighter, tapering to a blunt tip, which bears on either side a short, stout, often slightly recurved ear-like outgrowth formed by the prolongation of the anterior lip-cells, the posterior lips forming a usually angular, sometimes sharply pointed projection between them. Antheridia purplish, nearly straight or slightly curved, rather abruptly enlarged below the sharply pointed apex, the venter somewhat inflated. Perithecia 80–100 × 25 μ. Antheridia 35 × 7 μ. Total length to tip of perithecia 200–225 × 100–115 μ. Appendages 35 μ.

On *Philonthus flavolimbatus* Erichs., Panama, British Museum, No. 750 (Biologia Coll.); Las Vegas, Mexico, Sharp Coll. No. 1130; *P. parvimanus* Sharp, Chontales, Nicaragua, British Museum, No. 746 (Biologia Coll.); *Philonthus* sp., Mt. Gay, Est Grenada, West Indies, British Museum, 489 (Smith Coll.); *P. scybalarius* Nord., British Museum, No. 406, Madeira, also Scotland, Sharp Coll. No. 1126; *P. longicornis* Steph., British Museum, No. 408, Island of St. Helena, also Missouri, Sharp, Coll., No. 1127; *P. cruentatus* Gmel., British Museum, No. 358, Europe; *P. varians* Peck, British Museum, No. 359, Ealing, England; *Philonthus* sp. near *varians*, Australia, Sharp Coll. 1128; Europe, Berlin Mus., No. 821; *P. dimidiatus* Er., British Museum, No. 761, Notting Hill, England. On abdomen. A form, apparently this species, also from Hong Kong, on *Philonthus* sp., British Museum, No. 396, on *Philonthus* sp. near *P. scybalarius* Nord., Sydney, Australia, Sharp Collection, No. 1125 (very typical); *P. agilis* Grav., Austria, Berlin Museum, No. 822; *Philonthus* sp., Arabia, Sharp Coll., 1120; *P. ebeneus*, Grav., Siberia, Sharp Coll., No. 1121; also Berlin Museum, No. 820, Europe; *Philonthus* sp., Chile, Berlin Museum, No. 817; *P. bipustulatus* Panz., Europe, Berlin Museum, No. 819.

This common and widely distributed form, although it is in its typical form (Plate XXXI, fig. 5) one of the best distinguished and most easily recognized species in the genus, varies very greatly in the suffusion and development of its receptacle, which sometimes wholly lacks the black, fork-like upgrowths so characteristic in the figure referred to. It is very often associated, also, with what appears almost certainly to be a variety (fig. 9), that lacks the perithecial auricles and differs in its larger longer perithecia, and usually in its larger, sometimes almost colorless, receptacle: such forms, though usually shorter and stouter than the typical *D. princeps*, resembling this species very closely. A similar auricled form has not, however, been found to accompany the typical *D. princeps*, and specimens of typical *D. vulgatus*, from Europe, Australia (fig. 5) and North and South America, correspond in even the most minute details. Its hosts are usually larger *Philonthi* on which it may occur in large quantities. The species is closely allied to *D. dubius*.

DICHOMYCES DUBIUS Thaxter. Plate XXXII, figs. 7–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 426. April, 1900.

Receptacle much as in *D. princeps* and similarly colored, smaller, shorter, and stouter, antheridia large purplish; the distal tier of cells producing typically two, rarely more, perithecia, which are dull brownish and dimorphous; usually rather slender, tapering slightly, the posterior lip-cells producing ear-like outgrowths recurved or bent forward as in *D. vulgatus:* more rarely larger and stouter, the blunt, often asymmetrical tip without appendages; the two forms sometimes, but not usually, associated on the same individual: external appendages normally large, long, colorless, reaching to the middle of the perithecium or even to its tip. Individuals asymmetrical, with a single antheridium and perithecia of the second type, are not infrequently met with on the legs of the host. Perithecia 70–90 × 20 μ, those without appendages 70–105 × 30–35 μ. Spores 35 × 4 μ. Receptacle about 120 × 75 μ. Total length to tip of perithecium average 190 μ.

On *Philonthus æneus* Rossi, Niagara Falls, New York; Fresh Pond, Cambridge, Mass.

This species was first observed on material sent me from Niagara Falls by Mr. Bullard, and I have thus far seen it only on this host which is one of the largest species of *Philonthus* in this region. Abundant material has subsequently been obtained from Fresh Pond, near Cambridge, which, though usually very constant, often includes individuals in which the perithecia are not auricled and which closely resemble forms of *D. princeps* and some of the forms of *D. vulgatus* which are without auricles. It is perhaps possible that these three may be forms of one variable species, but although I have found *D. princeps* on a variety of hosts from various parts of the world, and in abundance, I have never seen it associated with *D. dubius,* unless it be on the above mentioned host. *D. vulgatus,* as I have already mentioned, is also associated with a form like *D. princeps* which is, however, usually larger and stouter with a tendency to black suffusions along the margins of the first tier (Plate XXXI, fig. 9), a tendency which, though it may occur in *D. dubius,* is never seen in *D. princeps.* In the present species the fork-like upgrowths of the second tier are wholly absent, or rudimentary, and never colored; in striking contrast to the normal condition in *D. vulgatus.* Despite these various points of resemblance, a careful reexamination of all the material has confirmed me in the opinion that the present species and probably the two others above referred to, should be regarded as distinct from one another. As in other cases *Peyritschiella*-forms, without auricles, are very frequently associated with this species.

DICHOMYCES HYBRIDUS Thaxter. Plate XXXI, figs. 15–19.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 423. April, 1900.

Basal cell small hyaline with a red brown suffusion near the base: lower tier narrow and elongate, opaque or sometimes with a median translucent line: middle tier rather narrow, not more than five of the median cells distinguishable, and more or less conspicuously marked on the anterior side by dark transverse flecks or striæ; distally hyaline or merely tinged with reddish brown above, becoming red-brown and finally opaque below; the margins opaque, continuous with those of the first tier and extending upward to form fork-like opaque projections, as in *D. furciferus,* which equal or exceed the upper tier in length; a single appendage arising posterior to the rather small purplish antheridium: upper tier relatively large, distally concave, composed of from fifteen to thirty-three nearly hyaline cells with reddish brown shades along the septa, the median cells sometimes flecked with reddish brown spots or transverse striæ toward the base, bearing two to six perithecia which may be of two types associated on the same individual or occurring on different individuals: the one type somewhat smaller, straighter and more erect, reddish brown, the lower half often abruptly paler or nearly hyaline, tapering rather abruptly to the tip, the lips of which are auriculate much as in *D. furciferus;* the other type larger, rather characteristically divergent, tapering rather abruptly to the truncate unmodified apex; appendages hyaline, sometimes as long as or even longer than the perithecia. Spores 35 × 4 μ. Perithecia 100–115 × 25–30 μ. Total length to tip of perithecium 250–300 μ. Receptacle 175–250 × 85–145 μ.

With both types of perithecia (the type form): on *Philonthus æneipennis* Boh., Paris Museum, No. 203, Gulf of Oman, India; on *Philonthus* sp., British Museum, No. 366, Sylhet, Assam, India; *Philonthus* sp., Bengal, India, Berlin Museum, No. 825: *P. Lewisius* Shp., Japan, Sharp Coll., No. 1122; on *Philonthus* sp., British Museum, No. 368, Hong Kong, China.

With only one form of perithecium (not appendiculate): on *Philonthus ventralis* Grav., British Museum, Ealing, England; Paris, No. 207, Funchal, Madeira; British Museum, No. 426, Europe, Berlin Museum, No. 823, Europe; Berlin Museum, No. 824, North America; on *Philonthus* sp., British Museum, No. 495, Balthazar, Grenada, West Indies; British Museum, No. 369, China; on *P. proximus* Woll., British Museum, No. 403, Canaries; on *P. gemellus* Kr., British Museum, No. 367, Ceylon; on *Philonthus* sp., Niagara Falls, N. Y. (C. Bullard); Fresh Pond, Cambridge.

The type form of this species in which the ordinary perithecia may be associated with, or wholly replaced by, a much shorter auriculate form, (figs. 16–17), has been found only on Asiatic material, and it seems very doubtful whether the form common on *P. ventralis* and other species of *Philonthus* should not be considered a distinct species. It is common on *Philonthi* about Fresh Pond, but neither in this nor in any material not Asiatic have I seen the dimorphic forms. The ordinary non-asiatic type has not been figured, but resembles that shown in fig. 15, perhaps somewhat smaller and more slender with usually longer and more slender "forks," and a more marked tendency to divergence in the perithecia, which is commonly characteristic. A close comparison of the non-auriculate Asiatic type and the ordinary extra Asiatic type has not enabled me to detect any difference that seems essential. Figs. 16–17 represent the forms which have been taken as the types of this species.

DICHOMYCES MADAGASCARENSIS Thaxter. Plate XXXII, figs. 11–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 424. April, 1900.

Basal cell deeply suffused with brown. Lower tier very long and slender, opaque except for a faint median translucent line: middle tier with three to five of the median cells distinguishable, red-brown; the rest indistinguishable in the opaque margins which extend upward to form long fork-like outgrowths on either side that may reach nearly to the tips of the perithecia; antheridia not large, brownish: upper tier consisting of about twenty-one to twenty-three cells, tinged with reddish brown, relatively large, deeply concave distally; the median cells like those of the middle tier, marked by fine faint transverse striæ, bearing normally two perithecia which are long and slender, often slightly curved and divergent, pale reddish brown, the tip narrow, the posterior lip-cells forming two small, slightly divergent projections or auricles curved at the tips, the anterior lips meeting in a point between them. Appendages hyaline, sometimes equalling the perithecia in length. Spores very slender and abundant, 35 × 2 μ. Perithecia 125–135 × 25 μ. Total length to tip of perithecium 320–350 μ. Receptacle 225–240 × 105 μ.

On abdomen of *Philonthus Sikoræ* Fauv., Paris Museum, No. 179, Tananarivo, Madagascar.

This is a large and well marked species, most nearly related to *D. hybridus*. It does not appear, however, to be dimorphic. The perithecia are never more than two, although the distal tier is unusually well developed, and are further more elongate with more slender auricles.

DICHOMYCES BIFORMIS Thaxter. Plate XXXIII, figs. 1–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 422. April, 1900.

Basal cell hyaline or nearly so, usually somewhat enlarged and often with a heel-like anterior projection; lower tier rather narrow, quite opaque, the marginal cells extending up to the subterminal marginal cell of the middle tier or to the cell next below it: the middle tier short and stout, the nine to eleven cells hyaline or faintly reddish brown above, usually becoming more or less suffused below and externally with brown; the median cells, where suffused, marked by darker transverse flecks on their anterior faces, the marginal cells ending in a blunt distal often hyaline prominence on either side; antheridia short and stout subconical, subtended by a single brown inconspicuous appendage: the distal tier assuming in well developed individuals the form of a rather slender crescent, the number of cells very variable, the maximum about fifty, sometimes less than half this number, in which case the form is stouter, the marginal cells rarely extending above the tips of the perithecia, which are four to eight in number and of two kinds which are not known to be associated on the same individual; in the one case they are stouter, purplish brown, the basal third, or more, often abruptly hyaline or nearly so, the much darker red brown tip tapering rather abruptly to the apex, which is hyaline, nearly truncate, with a well defined median blunt projection; the posterior lip-cells prolonged, much as in *D. insignis*, to form a long horizontal nearly cylindrical, or slightly tapering, bluntly tipped hyaline appendage on either side; the second type more often longer and more slender than the first, pale reddish brown, the tip tapering, slightly truncate or blunt, often with a blunt median projection as in the first type, but without appendages. Perithecia 105–110 × 20–35 μ. Receptacle 200 × 100–300 × 270 μ.

On *Philonthus* sp., Niagara Falls, New York, Mr. Charles Bullard: on *Philonthus umbratilis* Grav., British Museum, No. 362, Leicester, England; Paris Museum No. 206 and British Museum, No. 407, Madeira; Paris Museum, No. 175, St. Pierre et Miquelon: Scotland, Sharp Collection, No. 1213.

This species has been found by me repeatedly at Fresh Pond on *Philonthus umbratilis* and in every case the two forms have been associated. It is perhaps the most remarkable and striking species of the genus not only from its dimorphism and the highly developed auricles, but from the extraordinary development of the distal tier which, in one specimen observed, bore eight fully developed perithecia although four or six are most frequently present. I have seen no instances in which the two types of perithecia are associated on a single individual and the material examined has been so abundant that it seems hardly probable that there is ever more than one type in a given individual.

In the Sharp Collection a specimen of *Philonthus* labeled "*P. varians*? Victoria, Australia," is parasitized by a form closely related to the present, if not identical with it, but the specimens are too much broken to render an accurate determination possible. As far as has been definitely determined the host is always *P. umbratilis*, a rather large species with dark secondaries.

DICHOMYCES INSIGNIS Thaxter. Plate XXXII, figs. 3–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 421. April, 1900.

Basal cell suffused with reddish brown or partly hyaline; the lower tier wholly opaque or translucent along the median line; the middle tier consisting of about thirteen to seventeen cells, exclusive of those which are indistinguishable in the slender fork-like prolongations which extend on either side higher than the middle of the upper tier, the margin broadly blackened, continuous with the opaque margin of the lower tier; the lower portion of the three to five median cells marked by a few large scattered transversely elongated brown patches which merge on either side into the opacity of the marginal cells; antheridia very large, the venter slightly inflated, the neck sharply pointed, conical, brown, often abruptly contrasting, three to five of the cells immediately external to them bearing normal brownish appendages: distal tier very large subtriangular, distally concave, consisting of from twenty-nine to thirty-nine narrow and elongated cells and bearing from four to eight perithecia with some irregularity; the appendages brownish, paired above the subtending cell, not as long as the perithecia. Perithecia relatively small, purplish brown, tapering almost continuously from the broad base; the tip moderately well distinguished, the posterior lips prolonged to form long nearly straight and horizontal slightly inflated appendages, which project from the tip on either side; the anterior lips forming the truncate apex, which consists of two distinct lateral projections with an intervening convex portion having a median apiculus. Perithecia about 85 × 30 μ, appendages from tip to tip 35–39 μ. Antheridia 50 × 11 μ. Receptacle 300–340 × 200–230 μ. Total length to tip of perithecium 375–400 μ.

On an undetermined staphylinid collected by A. R. Wallace at Sarawak, Borneo, Hope Coll. No. 218.

The largest and finest species of the genus, sometimes even larger than the type represented in fig. 3. The perithecia diverge somewhat from the plane of the upper tier and thus seem in the figure somewhat shorter relatively than they really are. No indication was seen in the material obtained of the occurrence of a second type of perithecium. The figure given of the antheridium is only intended to suggest its structure, the outlines of the antheridial cells being too confused to draw with exactness. The antheridial cells appear to arise from more than one basal cell.

DICHOMYCES BIFIDUS Thaxter. Plate XXXII, figs. 14–16.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 26. June, 1901.

Basal cell slightly enlarged, pellucid, tinged with brown, about as long as broad: the lower tier, and more or less of the middle tier, opaque; the marginal cells of the latter forming a bluntly rounded, sometimes almost obsolete projection on either side, hardly extending above the venter of the short, stout, short-necked antheridia: the upper tier relatively large, more or less crescent-shaped according to the degree of lateral development, edged externally with blackish brown, more broadly below, the brown area punctate; the cells about thirty-one in the larger individuals, the marginal ones forming a rather slender series, which may curve abruptly upward nearly to the middle of the perithecia, or assume a more divergent habit; the perithecigerous area horizontal, producing normally four perithecia, three appendages arising between the two middle ones and one between each of the others, the external cells bearing appendages as usual which vary in length. Perithecia rather long and slender, hyaline or faintly yellowish brown, conspicuously tinged with purplish brown below the perfectly hyaline tip, the anterior lip-cells forming a pointed projection, the posterior ones forming each a relatively large ear-like appendage which tapers to a pointed apex, and is slightly curved, the two diverging from one another at an angle of about 50°. Spores about 38 × 2.5 μ. Perithecium without appendages 126 × 25 μ; the appendages 14 μ. Receptacle 220–350 × 120–165 μ. Total length to tip of perithecium 300–330 μ. Appendages 20–80 μ.

On the abdomen of (?) *Philonthus* sp. Ralum, New Pomerania. Berlin Museum, No. 1013.

A very beautiful and peculiar species, distinguished from all others by its stout tooth-like auricles which make the tip of the perithecium appear bifid. Although scanty, the material is in fine condition, the host having been brought in alcohol by Dr. Dahl.

DICHOMYCES AUSTRALIENSIS Thaxter. Plate XXXIII, figs. 10–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 28. June, 1901.

Receptacle usually rather long and narrow, the basal cell relatively large, hyaline or slightly suffused; the margins of the lower tier usually continuous with those of the middle one, the marginal cells deep blackish brown or quite opaque, the middle cell hyaline or translucent throughout its lower third often punctate: the middle tier consisting of about nine cells, slightly suffused with pale reddish brown externally, more or less edged with deep blackish brown; the terminal cells forming a free rounded projection on either side, extending as high as about the middle of the rather large antheridia, the tips of which may reach to the base of the perithecia: the upper tier nearly hyaline, consisting normally of from eleven to thirteen subequal cells, the terminal ones extending but slightly higher than the bases of the perithecia, which are normally two in number, rather deeply suffused with purplish brown throughout; the apex hyaline, the posterior lip-cells producing each a relatively large bluntly pointed appendage, the two diverging nearly at right angles to the axis of the perithecium, becoming slightly recurved, the distance from tip to tip about twice the diameter of the perithecium. Appendages nearly as long as the perithecia. Perithecium 60–70 × 16–20 μ, its appendages 18 μ. Receptacle 90–100 × 42–48 μ. Total length to tip of perithecium 160–170 μ.

On the superior surface of the abdomen of *Quedius ruficollis* Grav., Sharp Collection, No. 1102.

A species peculiar for its long recurved auricles which are unlike those of any other species except *D. Mexicanus* from which its compact form, dark color, cylindrical auricles, and pointed tip serve readily to distinguish it.

DICHOMYCES MEXICANUS Thaxter. Plate XXXIII, figs. 14–17.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 28. June, 1901.

General habit much like that of *D. princeps*, generally rather long and slender. Basal cell hyaline, the lower tier relatively long and narrow broadly edged externally with black; the median cell hyaline, or only the marginal cells slightly suffused with smoky brown: the middle tier distinguished from the lower by a slight prominence, hyaline, seven to nine-celled; the marginal cells protruding but slightly on either side; the antheridia brownish, short, stout, blunt-pointed: the upper tier relatively very long, sometimes twice as long as the middle tier, consisting of from nine to eleven cells; the marginal cells protruding but slightly on either side, very much as in the middle tier. Perithecia normally two, about as long as the distal tier and concolorous with it, or somewhat darker, rather stout, tapering but slightly; the tip rather abruptly distinguished, broadly truncate with a slight median projection; the posterior lip-cells giving rise each to a long horizontal appendage, which becomes recurved, is bluntly pointed and somewhat narrower toward the base, the distance from tip to tip often twice the diameter of the perithecium. In a few specimens the receptacle and perithecia are somewhat evenly suffused with smoky brown. Perithecia 75–85 × 25–30 μ, the appendages 18–22 μ. Receptacle 165–200 × 55–70 μ. Total length 235–275 μ.

On the inferior surface of the abdomen of *Philonthus atriceps* Sharp. Jalapa, Mexico. Sharp Collection, No. 1112. Specimens, sometimes occur in which the tips of the perithecia are blunt and unmodified, but this condition may have resulted from breakage or be due to immaturity. The species is closely related to *D. Australiensis*, from which it differs in its more elongate form, somewhat clavate auricles, and the conformation of the tip of the perithecium. A few specimens lack entirely the usual blackish-brown suffusions, and except for the auricles very closely resemble typical individuals of *D. princeps.* It was found abundantly on a single specimen in a large series of its host in Dr. Sharp's Collection.

DICHOMYCES PERUVIANUS Thaxter. Plate XXX, figs. 3–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 426. April, 1900.

Receptacle with faint brownish shades especially along the septa, almost in the form of two superposed isosceles triangles, the lower very regular, including the basal cell and the first and second tiers, its distal margin horizontal, the upper truncate at the base and distally concave. The basal cell short, the lower tier consisting of from three to four cells, nearly equal in length; the middle tier of typically thirteen cells, the antheridia of medium size, the outer five cells distally appendiculate, one of the appendages situated behind the antheridium as usual; the distal series consisting of usually twenty-seven cells bearing typically four perithecia, the appendages placed as usual, colorless, somewhat shorter than the perithecia, which are mostly brownish externally and hyaline on the inner side, the brown or reddish fawn-color sometimes predominating, asymmetrical, somewhat inflated, slightly bent inward near the tip which is small, pointed, and well distinguished. Perithecia about 120 × 30 μ. Receptacle 207–240 × 140–175 μ. Appendages 185 μ (longest). Total length to tip of perithecium 300–350 μ.

On *Brachyderus simplex* Sharp, Sharp Collection, No. 774. Peru. On *Plociopterus lætus* Sharp, Garrao, Amazon, Sharp Collection, No. 1156.

The types of this species from Peru (fig. 4) are somewhat more slender and darker than the Amazon material (fig. 3). The species differs from all others by the pointed tip of its perithecium, which results from a prolongation of the posterior lip-cell, *i. e.* on the side opposite that which corresponds to the insertion of the antheridia. The suffusion of the anterior and posterior wall-cells is also a well marked character not seen elsewhere, the limitation of perithecial suffusions in other species being transverse, as a rule. It is most nearly allied to *D. princeps,* stout forms of which often resemble it closely except for the perithecial suffusions and pointed tip.

DICHOMYCES PRINCEPS Thaxter.

The occurrence of forms resembling this species, or identical with it in appearance, has been noted under *D. vulgatus* and *D. dubius.* Specimens of the typical form occurring unassociated with any other have been found as follows. British Museum No. 371, *Philonthus* sp., Blois, France; No. 380, *Philonthus* sp., S. W. Australia; No. 406, *Philonthus Scybalarius,* Madeira; No. 424, *Philonthus cephalotes* Grav., Europe; No. 372 on *Philonthus* sp., North India; No. 743, (Biologia Coll.), Mexico, on *Quediomarcus puniccipennis* Solsk.: Paris Museum; No. 208, on *P. longicornis* Steph. Madeira; No. 46, on ? *Philonthus* sp. Mexico; Berlin Museum No. 815, *P. sordidus,* Europe; No. 816, on *Philonthus* sp., St. Vincent: Sharp Collection, No. 1118, on *P. sordidus,* California.

DICHOMYCES INFECTUS Thaxter. Plate XXXI, figs. 3–4.

This species, which was described from a unique type, has been found again at Fresh Pond, Cambridge, on *Xantholinus obsidianus* sometimes associated with *D. furcatus,* or a form hardly distinguishable from this species. It usually assumes the form represented in fig. 4, but sometimes develops short "forks" as in fig. 3. The perithecia are always normally paired and usually diverge decidedly.

DICHOMYCES ANGOLENSIS Thaxter. Plate XXX, figs. 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 421. April, 1900.

Basal cell hyaline. Lower tier opaque or the middle cell subhyaline, the marginal cells opaque, extending up on either side of the middle tier: middle tier relatively large, consisting of about thirteen to sixteen hyaline cells, the three to four external ones continuing the margin of the first tier directly and either subhyaline or blackened below, each bearing a normal appendage; the antheridia of medium size, brownish: upper tier smaller, shorter, and narrower than the middle one, consisting of from thirteen to fifteen hyaline cells: distally slightly concave, bearing a pair of perithecia, the appendages small, hyaline. Perithecium large and stout, straight, faintly brownish, slightly inflated, tapering distally to the nearly symmetrical truncate apex. Perithecia 120–135 × 30 μ. Length to the tip of perithecium 250 μ. Greatest length of receptacle 140 × 75 μ.

On elytra of *Philonthus* sp. indet. British Museum, No. 379. Angola, Africa.

This species is characterized by the relatively small distal tier and well developed middle tier which, however, produces no black fork-like prolongation, or a very short one. Although I should be at a loss where to refer it, I should not, with my present knowledge of the genus, be inclined to describe it as a distinct species without examining more material: yet it appears to differ from any forms with which it might be confused, by the inconsiderable development of its upper tier.

DICHOMYCES CAFIANUS Thaxter. Plate XXX, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 425. April, 1900.

Tinged with dull amber-brownish throughout, the perithecia darker. Basal cell nearly hyaline, the lower tier as in *D. vulgatus*, the opacity involving in general but half of the upper (external) cells, the septa of which are visible on the inner side, the median cell dark brown, its lower half or more opaque: the middle tier consisting of typically thirteen cells, the margins unmodified and ending in a short external rounded projection, which does not extend beyond the base of the upper tier; the rather inconspicuous antheridium normally placed, concolorous, a single short appendage close behind it: the upper tier consisting of from nineteen to twenty-three, usually twenty-one, cells, forming an inverted crescent, the short, stout, bladder-like appendages arranged as in *D. vulgatus*. Perithecia normally two in number, somewhat inflated externally, nearly straight, slightly asymmetrical, rather stout, tapering to the bluntly pointed undifferentiated tip. Spores 45 × 4.5 μ. Perithecia 120–140 × 35–40 μ. Receptacle 200–250 × 100–140 μ. Total length to tip of perithecium 310–350 μ. Appendages about 20 × 6 μ.

On *Cafius puncticeps* White, British Museum, No. 381. Colenso, Natal, Africa.

This species is very similar to the variety of *D. furciferus* which is described under that species (Plate XXXI, figs. 10–12), but is much larger than the largest individuals seen in the abundant material of this form which has been examined. The perithecia are relatively smaller and the receptacle relatively larger, especially the upper tier, which is more highly developed. The present species has an individuality which it is hardly possible to describe, and although the two forms appear in general so closely allied they are very readily distinguished when the actual specimens are compared. It must be admitted, however, that the two may prove varieties of one species, although I am distinctly of opinion that they should be kept distinct.

DICHOMYCES EXILIS Thaxter. Plate XXXI, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 420. April, 1900.

Basal cell hyaline. Median cell of lower tier deeply suffused with brown but not opaque; marginal cells wholly opaque or translucent on the inner margins, extending upward so as to enclose the base of the second tier; second tier consisting typically of thirteen cells, colorless or partly suffused with brownish, the antheridia large brownish straight or slightly curved, the venter inflated, the cells external to them, appendiculate, the outer three free above the marginal prolongation of the lower tier and forming a short blunt projection on either side: upper tier like the middle one, mostly somewhat longer and narrower, consisting of from thirteen to fifteen cells, the sub-median ones nearly triangular and for the most part distally overlapped by the external cells next in order and the basal cells of the perithecia. Perithecia typically two, pale brownish amber, long and narrow, slightly if at all inflated, tapering gradually to the undifferentiated broad nearly truncate apex. Spores 35 × 4 μ. Perithecia 130–140 × 22 μ. Receptacle 130–140 × 22 μ. Total length to tip of perithecium 250–275 μ.

On *Philonthus xanthomerus* Kraatz., British Museum (Biologia Coll.), No. 751, San Andres, Vera

Cruz; on *Philonthus oxysporus* Sharp, Oaxaca, Mexico. Sharp Collection, No. 1113, on *Belonuchus formosus* Sharp Coll. No. 1138, Jalapa, Mexico.

This species appears to vary to a form in which the perithecia are not greatly elongated, but it is possible that two distinct species are associated in the material examined. The typical form (fig. 2) which may develop four very elongate perithecia is sufficiently distinguished by this character from all others.

DICHOMYCES JAVANUS Thaxter. Plate XXXII, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 420. April, 1900.

Perithecium solitary as long or longer than the receptacle, clear dark reddish brown, translucent, straight or slightly curved, rather slender, of about the same diameter throughout, the tip usually abruptly distinguished, and more or less conspicuously bent to one side, tapering but little to the rather broad blunt undifferentiated apex. Receptacle rather narrow, the basal cell dark red-brown below, nearly hyaline above; the central cell of the lower tier dark red or red-brown, lighter or hyaline at the base; the cells on either side symmetrical, blackish brown, opaque, extending upward so as to partly enclose the base of the second tier, the margins of the two tiers coincident: the second tier composed of from seven to nine cells, hyaline or becoming suffused below with reddish brown, bearing a well defined sharply pointed purplish slightly asymmetrical antheridium, on either side, which is subtended by from one to two typical rather short appendages: the upper tier very similar to the middle, or slightly larger, nearly hyaline, the single perithecium rising to the right of the median appendage, the right half of the tier thus somewhat larger and higher than the left, three typical appendages usually present on either side. Perithecia 145 × 26 μ. Spores about 36 × 4 μ. Receptacle 120–140 × 50 μ. Total length to tip of perithecium 250–275 μ.

On the abdomen of *Philonthus* sp. Java, British Museum, No. 375.

This small species is well distinguished by its geniculate habit, and the abruptly bent tip of its elongate single perithecium.

DICHOMYCES HOMALOTÆ Thaxter. Plate XXXI, figs. 13–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 29. June, 1901.

Form short and stout. Basal cell geniculate, more or less suffused: the lower tier more or less, sometimes wholly, suffused with reddish brown; the margins darker, more or less translucent, without contrasts, the outline somewhat uneven, the transition to the middle tier indicated by a distinct prominence: the middle tier consisting of from nine to (rarely) thirteen cells, hyaline or subhyaline, with slight lateral suffusions; the marginal cells ending in a slight hyaline rounded projection, not extending higher than the venters of the somewhat suffused curved antheridia or extending upward nearly to the middle of the perithecium, with black marginal suffusions and usually asymmetrical on the two sides: the upper tier relatively small, the cells subequal, hyaline, asymmetrical, owing to the development of but one perithecium; the appendages often equalling, or exceeding the perithecium in length. Perithecium characteristically short and stout, inflated below, sometimes oval, tapering somewhat abruptly distally, to the rather broadly truncate, or slightly rounded unmodified apex. Spores 33 × 3 μ. Perithecia 65–75 × 25–30 μ. Receptacle 70–90 × 40–55 μ. Total length 125–165 μ.

On *Homalota sordida* Marsh. Fresh Pond, Cambridge, and Kittery Pt., Me.

A species not very frequently met with and first observed by Mr. Bullard. When mature (fig. 14) it is clearly distinguished from other species having a single perithecium by its asymmetrical middle tier, long appendages, and red-brown translucent suffusions, which often extend to the middle cells of the middle tier without involving the septa. The species is further exceptional, like *D. Peruvianus*, from the numerous appendages developed on the cells of the middle tier. Curiously enough, it is partial to the head and anterior superior portions of its host, where it is most frequently found, although it also occurs on the abdomen. It is probable that it infests more than one species of *Homalota*, but only a single individual has been determined.

DICHOMYCES INÆQUALIS Thaxter.

Syn. *Peyritschiella nigrescens* Thaxter.

I have already called attention to the fact that *Peyritschiella nigrescens* figured in my monograph is undoubtedly a "reversion" of this species to the *Peyritschiella*-condition, a phenomenon which is likely to occur in all the species of *Dichomyces* when the individuals grow under unfavorable conditions, as on the legs of the host. The typical *D. inæqualis* seems to occur only on *Philonthus debilis* and is very constant in its characters. A single specimen of this host in Dr. Sharps collection, No. 1213, from Scotland, was found infested, and the individuals correspond exactly to the American types.

PEYRITSCHIELLA Thaxter. XXX. 8-11 Part I. p. 278.

I have already called attention to the close connection of this genus with *Dichomyces* from which it differs only in its asymmetrical habit, and also to the fact that a majority of the species of the latter genus assume the typical *Peyritschiella*-type when growing under unfavorable conditions as on the legs of their hosts. Despite this fact I feel that the two genera are best kept apart, and are sufficiently distinguished.

PEYRITSCHIELLA PROTEA Thaxter. Plate XXX, figs. 8–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 427. April, 1900.

Perithecia translucent, brownish amber-colored, rather stout and symmetrically inflated, the symmetrical tip tapering rather abruptly, the apex rather narrow truncate, the lip-edges unmodified. Receptacle nearly or quite hyaline, consisting of a single basal cell, above which the three typical tiers of cells are very variously developed: the lowest of these may rarely consist of a single cell, often of three which do not project laterally, or in well-developed specimens of as many as twelve or more cells, those external to the middle three forming on either side distal external angular usually asymmetrical projections, one or both of which may bear terminally one or even two perithecia and typical appendages: the middle series like the lower, when the latter is well developed, subtriangular in form, consisting of sometimes as many as fifteen to eighteen cells, generally somewhat asymmetrical; a single perithecium usually arising distally from the projecting portion on either side, together with numerous typical appendages: the distal tier similar to the middle one, mostly smaller, somewhat asymmetrical, bearing usually a single perithecium above the median cell, though not produced from it, the remaining cells bearing typical appendages, often as long or longer than the perithecium, the small subtending cell being unusually well defined. Subject to great variation, and sometimes producing more than one antheridium. Perithecia 80–96 × 32 μ. Receptacle 270 × 80–100 to 120 × 45 μ. Total length to tip of perithecium 200–350 μ.

On *Bledius bicornis* Germ., British Museum, No. 392, Europe (Thuringia), No. 432, Europe; on *Oxytelus rugosus* Fabr., British Museum, No. 450, Hampstead, England; on *Acrognathus mandibularis* Gyll., British Museum, No. 434, Europe; on *Oxytelus* sp., Fresh Pond, Cambridge. On legs, elytra, and prothorax.

In small specimens the two lower tiers may be but slightly developed, bearing neither appendages nor perithecia, the middle producing one antheridium, the number of cells and appendages on one side of the perithecium being, as in all species, greater than on the other. Occasionally, as in fig. 9, accessory perithecia may develop from the middle or even the second tier, and a second antheridium, even, may arise; but such conditions are abnormal. Although the simplest individuals differ so widely in appearance from those more highly developed, I think that I am right in placing under this species all the forms here included. The specimens from *Bledius bicornis* are regarded as the type forms, and both figures have been drawn from this material.

PEYRITSCHIELLA AMAZONICA Thaxter. Plate XXX, fig. 10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 427. April, 1900.

Perithecium translucent brown, about as long as the receptacle, sub-clavate, large, contracted below to form a neck-like base, somewhat inflated distally, the tip well, though not abruptly distinguished, tapering to the nearly truncate apex formed by the slightly expanded tips of the lip-cells which are otherwise unmodified. Receptacle rather narrow, pale translucent brown, consisting of a single basal cell followed by three tiers of cells; the lower symmetrical or nearly so, consisting of three long narrow nearly equal cells not appendiculate and not projecting laterally: the middle tier not asymmetrical, consisting of about twelve cells, the series projecting distally on either side, all the cells, except the three larger median and the external ones, producing distally short typical appendages, the third cell on the right from the median cell bearing a prominent erect antheridium: the terminal tier very similar to the middle one, consisting of about the same number of cells which produce short typical appendages distally and (in the types) a single nearly median perithecium. Perithecia 200–210 × 36 μ. Receptacle 225 × 70 μ. Antheridium 45 μ long. Total length to tip of perithecium about 400 μ.

On an undetermined staphylinid. British Museum, No. 400, Nanta, Amazon River.

This and the following species, *P. Xanthopygi*, should in all probability be united, although none of the numerous specimens of the latter possess the stalked and subclavate perithecia characteristic of the present species, and there are slight differences in the form and structure of the receptacle. Although I do not regard them as distinct, both names are here provisionally retained until more and better material of the present form can be examined.

PEYRITSCHIELLA XANTHOPYGI Thaxter. Plate XXX, fig. 11.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 29. June, 1901.

Basal cell of the receptacle very small, or hardly distinguished from the foot: the first tier consisting of three subequal cells without appendages, the middle one somewhat shorter than those on either side of it: the second tier asymmetrical, consisting of three subequal median cells, the margins of the two outer free below for nearly half their length and coincident with the margins of the tier below, the appendiculate "marginal" cells, about three to five on either side, separated from them as usual by oblique septa; the first on the right bearing the large, slender, pointed, nearly straight purplish antheridium: the upper tier consisting of about fifteen or more cells, the series distally concave, rising abruptly upward on either side above the base of the perithecium and bearing the usual appendages. Perithecium solitary at the right of the median (primary) appendage, almost symmetrically inflated from base to apex, dull purplish; the tip slightly darker, hardly distinguished; the apex truncate, sometimes slightly spreading; the lip-cells hardly projecting. Perithecia 115–150 × 34–42 μ. Receptacle 200 × 65–70 μ. Total length to tip of perithecium 310–360 μ.

On the abdomen of *Xanthopygus Solskyi* Sharp. Sharp Collection, No. 1158.

A form which is probably not distinct from *P. Amazonica*, although differing in possessing a stalked and symmetrical perithecium.

LIMNAIOMYCES Thaxter. XXXIV 14-18

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 428. April, 1900.

Receptacle consisting of two portions, a basal part below the perithecium and a distal part united to its posterior margin; the basal portion consisting of a single basal cell, surmounted by two tiers of cells, the anterior cell of the upper tier giving rise to a compound antheridium in structure similar to that of *Peyritschiella:* the distal (marginal) portion consisting of an inner and an outer elongated cell, the inner terminating in one of the bell-shaped appendiculate cells characteristic of *Chitonomyces*, separated from the simple appendage by a broad, constricted, blackened septum; the outer, by successive subterminal external proliferations, forming a series of cells from which a smaller secondary appendiculate cell is separated above. The proliferation taking place to the right and left successively, so that the appendages appear to arise in two rows.

This aquatic genus forms a very perfect link between the closely allied aquatic genus *Chitonomyces* and the terrestrial genera *Peyritschiella* and *Dichomyces.* The antheridium, unlike that of *Chitonomyces,* is inserted laterally, like that of *Peyritschiella,* although in a different relation to the perithecium, and its character can readily be determined. The regular arrangement of the cells of the receptacle in tiers recalls very strongly the conditions in the terrestrial genera just mentioned, although the perithecium comes to be related to the receptacle as it is in *Chitonomyces,* the marginal portion, as in this genus, being terminated by a similar characteristic, bell-shaped cell. Both the species occur in North America on large water beetles, Hydrophilidæ.

LIMNAIOMYCES TROPISTERNI Thaxter. Plate XXXIV, figs. 14–15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 428. April, 1900.

Perithecium amber-brown, straight, erect, with a slight nearly median inflation, or tapering but very slightly to the undifferentiated tip; the upper half free. Receptacle pale straw-colored, distally dull amber-brownish, the foot minute, black; the basal cell short and small, the lower tier consisting of two cells which are nearly equal, several times as long as broad: the second tier consisting of three cells, the posterior one longest, the median longer than the anterior, which terminates in the antheridium, which is subtended by four basal cells, two of them outer and lower and separated by oblique partitions, while a smaller upper one lies on either side: above the antheridium two vertically elongated cells form the clearly defined base of the perithecium; external to these cells, and somewhat obliquely separated from them, lies the broad base of the inner marginal cell of the distal portion of the receptacle, which lies next above the middle cell of the upper tier, its cavity nearly obliterated above as the spores mature, the primary appendiculate cell which terminates it rather elongate; the proliferation of the outer marginal cell beginning quite near its base, forming a series of about eight cells separated by oblique septa and terminated by small appendiculate cells; the appendages very small, vesicular, brownish below. Perithecia 127–175 × 35–37 μ. Receptacle, distal part 75–110 μ. Appendages 6 × 3 μ. Total length to tip of perithecium 240–375 μ, to tip of receptacle 190–265 μ.

On *Tropisternus* sp. indet., Paris Museum, No. 47. Mexico. On tip of abdomen.

This species is conspicuous from its large size and dark brown color, and is readily seen projecting from the tip of its host's abdomen. That it has been observed only once on specimens in alcohol in the Paris Museum, may perhaps be accounted for by the fact that it appears to be very readily detached, and grows in an exposed situation. In any case it has been sought for in vain on the very numerous Central and South American *Tropisterni* that have been subsequently examined.

LIMNAIOMYCES HYDROCHARIS Thaxter. Plate XXXIV, figs. 16–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 429. April, 1900.

Hyaline. Perithecium rather stout and short, somewhat inflated, its tip abruptly bent outward, the apex bluntly rounded or nearly truncate; the tip and the appendiculate cell usually symmetrically divergent. Basal portion of the receptacle relatively short and stout but otherwise similar in structure to that of *L. Tropisterni;* the two basal cells of the perithecium almost obliterated at maturity so that its base appears to rest immediately on the antheridium; the distal portion of the receptacle bordering the perithecium to its tip, the inner cell becoming almost wholly obliterated in the middle and terminating in a short bell-shaped appendiculate cell which is slightly divergent: the outer marginal cell usually proliferating three times; of the three cells thus formed the two inner, as a rule, produce well developed, long, simple, hyaline appendages; not, however, as well developed as the primary appendage, which may be twice as long as the perithecium. Spores 50 × 3 μ. Perithecia 60–80 × 17–20 μ. Receptacle, basal part, 50 × 20–26 μ, distal part 50–62 μ. Appendages, longest, primary 140 μ, secondary 70 μ. Total length to tip of perithecium 100–128 μ.

At tip of abdomen of *Hydrocharis obtusatus* Say, Cutts Island, Kittery Point, Maine.

Unlike the preceding species the present form, being small and pale, is seen with great difficulty, growing as it does appressed on the anal appendages of its host. Although I have examined many specimens of *Hydrocharis* from the same locality, a pond occupying the highest point on Cutt's Island, as well as from other localities in North and South America, I have seen this species but once.

CHITONOMYCES Peyritsch. XXXIV, 17-40 XIII 37-38. Part I p. 285.

The additions to this genus have not been very numerous since the publication of my monograph, in part because no special effort has been made to obtain them, and in part for the reason that small exotic Dytiscidæ do not appear to be well represented in the collections examined. Moreover, after the host has been mounted and has become well dusted, it is almost absolutely impossible to see the smaller forms. The genus is no doubt a large one, and species are sure to be multiplied when the tropical forms can be examined fresh or in alcohol. Nevertheless a few very characteristic forms are herewith illustrated, among which *C. psittacopsis* and *C. Bullardi* are among the most singular yet discovered. A special interest also attaches to *C. Javanicus*, since, with *C. marginatus* and *C. melanurus*, it represents a small group of species, closely allied and evidently either derived from one another or from a common source, and all growing in exactly the same position on the same (left) wing of species of *Laccophilus*.

No attempt has been made since the publication of my Monograph to determine more exactly the nature of the antheridium which, in most species, is so small that it can be detected only with the greatest difficulty, placed as it is on the side of the individual next the perithecium and thus never visible in profile. A careful study of the antheridia, in forms like *C. rhyncostoma* or *C. paradoxus*, in which they appear to be unusually large, is much to be desired. The close relation of this genus to *Limnaiomyces* in which the compound antheridia are evident, cannot be doubted.

All the species added herewith afford further illustrations of the remarkable constancy with which these plants occur in definite positions on the hosts, a condition which is to me quite inexplicable unless, as previously suggested, it is brought about by automatic motions of the legs while the insects are *in coitu*. This explanation, however, seems insufficient to account for the restriction of eight or nine species on a single host to a corresponding number of definite positions.

The two nearly related species, *C. Aethiopicus* and *C. Orectogyri* should probably be removed from this genus, although very closely related to it. It will be necessary to examine young conditions, however, before this can be determined. With the exception of these two forms which occur on *Gyrinidæ*, the species of the genus are all found on small water beetles belonging to the Dytiscidæ and Haliplidæ.

CHITONOMYCES HYDROPORI Thaxter. Plate XXXIV, figs. 28–29.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 32. June, 1901.

Receptacle nearly hyaline, the subbasal cell flattened, many times smaller than the basal cell, slightly inflated and distinguished from the cells above and below by slight constrictions; the two cells above subequal, the posterior somewhat broader, and separated from the lower marginal cell of the distal portion by an oblique curved septum, which overlaps its upper fourth; the subterminal marginal cell often nearly as long as the lower, the narrow upper half, or more, of which it overlaps. The lower appendiculate cell rather small, the upper terminal one of the typical form, relatively rather long, distinguished by a slight constriction, the appendage extending beyond the tip of the perithecium. Perithecium relatively large, its upper half, or more, free, distally broader, the outer margin nearly straight with as light subterminal rounded elevation below the abruptly rounded projecting outer brownish lip-cells; the apex otherwise flat, broad, bent outward so as to be slightly oblique, the inner margin below it bulging and curved throughout. Spores 55 × 4 μ. Perithecium 98–108 × 25 μ. Receptacle to base of perithecium 80 μ, to tip of terminal cell 150 μ. Total length to tip of perithecium 185 μ.

On the mid-elytron of *Hydroporus modestus* Aubé, Cape Neddock, Maine (Mr. Bullard); on *Hydroporus* sp., Daytona, Florida.

This species is distinguished by the broad out-turned tip of its perithecium and the enlargement of the cells immediately above the very small subbasal cell. The Florida specimens are slightly smaller than those from Maine and were found on the inferior surface of the abdomen of a small *Hydroporus*. They correspond with the types, however, in all essentials.

CHITONOMYCES FLORIDANUS Thaxter. Plate XXXIV, figs. 36–38.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 430. April, 1900.

Pale straw colored with a smoky, brownish tinge, the basal and subbasal cells relatively large, the former rather elongate, the latter broader than long, the distal cell erect, conical, appendiculate, its basal septum horizontal. Perithecium relatively large, distally somewhat inflated, the posterior margin to the apex nearly straight, the tip moderately well distinguished, the inner margin strongly convex between the tip and the secondary appendage; the lip-cells each forming a more or less distinct papilla. Spores relatively large about 35 × 3 μ. Perithecia 70 × 28 μ. Receptacle, distal part, 62 μ, the two basal cells with foot 52 μ. Total length to tip of perithecium 120–138 μ.

On *Cnemidotus 12-punctatus* Say, Eustis Florida, October. On legs and elytra.

An insignificant species superficially resembling *Hydraeomyces* but structurally different. The hosts were captured on the margin of Lake Eustis near the landing.

CHITONOMYCES OCCULTUS Thaxter. Plate XXXIV, figs. 30–31.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 30. June, 1901.

Short and stout, becoming suffused with somewhat smoky amber-brown. Lower portion of the receptacle deeper brown, the basal cell relatively large, broad distally; the subbasal cell broad and flattened; the lower cell of the distal portion rather large and but slightly overlapped by the subterminal cell, which may bulge slightly below the terminal cell, the latter being thus turned so as slightly to overlap the perithecium. Perithecium short and stout, its upper third or less free, darker brownish externally; the tip bent outward, tapering rather abruptly to the slightly irregular apex, its outer half or less suffused with dark brown. Spores about 22 × 2.5 μ. Perithecium 60 × 20 μ. Receptacle to tip of distal cell 90 μ. Total length to tip of perithecium 100 μ.

On the right elytron of *Cnemidotus* sp. Lake Eustis, Florida.

This characteristic little form grows concealed in a depression of the margin near the middle of the right elytron and would readily remain unnoticed unless sought for.

CHITONOMYCES PARADOXUS Peyritsch. *fig 39*

Specimens of this form have been obtained on species of *Laccophilus* from Lake Eustis Florida, and again from *L. minutus* and *L. hyalinus* from Europe (British Museum No. 487, England, and Berlin Museum Nos. 1053–1054, from Europe), and a well marked variety, Plate XLII, fig. 39, has been observed on a small *Laccophilus* from Java (Rouyer, No. 1396). This is distinguished by its more slender straighter habit, by the more erect and slender terminal horn-like perithecial outgrowth, and by the conformation about the pore. It grows in exactly the same position as the type form, and though a well defined variety, should not, I think, be specifically separated.

CHITONOMYCES DENTIFERUS Thaxter. Plate XXXIV, figs. 26–27.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 306. July, 1905.

Pale straw-colored. Receptacle nearly straight, the foot large, the basal cell about twice as long as broad, but slightly broader distally, the subbasal cell broader than long, distinguished above and below by a more or less distinct constriction, the lower marginal cell longer than the next above it, the terminal cell subcylindrical with broadly rounded apex bent slightly inward. Perithecium distally curved inward above a suberect, tooth-like, unicellular appendage, which is curved slightly outward, and originates above a rounded more deeply colored prominence, which subtends it and lies nearly opposite the extremity of the distal appendiculate cell of the receptacle, which it about equals in length. The tip of the perithecium tapering, the lip-cells slender and somewhat elongate, with rounded extremities. Total length to tip of perithecium 90–110 × 18–20 μ. Perithecium about 65 × 18 μ. Basal portion of receptacle about 35 μ. Spores about 28 × 3 μ.

On the margin of the left elytron of *Laccophilus proximus* Say, near the base, Lake Eustis, Eustis, and Daytona, Florida.

This species is distinguished from all others by the position and form of its perithecial appendage. The tip of the perithecium has the same somewhat shriveled appearance that is seen in *C. appendiculatus* from which, though its nearest ally, it is abundantly distinct.

CHITONOMYCES SPINOSUS Thaxter. Plate XLII, fig. 40.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 307. July, 1905.

Basal and subbasal cells of the receptacle subequal, the latter somewhat broader; the lower marginal cell relatively short and broad; the lower appendiculate cell relatively large; the upper marginal cell bearing distally a long unicellular amber-brown outgrowth, about half the total length of the individual, projecting upward and outward at an angle of about 45°, with a slight terminal twist, and subtended by a prominent bulge of the cell which bears it: the distal appendiculate cell relatively large and broad. Perithecium rather stout, the transverse limits of the wall-cells indicated externally by more or less pronounced elevations, the blunt tip somewhat abruptly distinguished above the nearly straight inner margin. Total length to tip of perithecium, including foot, 130 μ, greatest width 33 μ. Marginal appendage 45–60 μ. Spores about 28 × 2.5 μ. Perithecium 75 × 20 μ.

On the left posterior leg of *Laccophilus* sp., Java. Rouyer, No. 1394.

This species is immediately distinguished from all others by the spinous process which projects from the penultimate cell of the distal portion of the receptacle. Although it occurs in the same position on its host it does not seem nearly related to *C. spinigerus* which possesses a spine arising from the base of the perithecium.

CHITONOMYCES BULLARDI Thaxter. Plate XXXIV, figs. 32–35.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 31. June, 1901.

Straw-colored becoming tinged with pale amber-brown. Basal cell of the receptacle monstrously developed, about as long, sometimes twice as long, as the remainder of the plant, its axis coincident with that of a distal, variably developed, blunt, tooth-like, free posterior projection, near the base of which the subbasal cell and the remainder of the plant project backward at an angle of about 45°, or less, to the axis of the basal cell, the separating septum being vertical or nearly so; the subbasal cell small and flattened: the lower marginal cell of the distal portion of the receptacle subtriangular, short and broad; the lower appendiculate cell above it relatively large; the subterminal cell larger than the lower marginal cell, curved inward so that the terminal appendiculate cell projects from it obliquely inward against the perithecium. Perithecium four fifths or more free, relatively large and stout, distinctly inflated below, tapering to the tip, which is characteristically modified through the presence of a large claw-like subterminal dark amber-brown external projection, the distal half of which is somewhat abruptly recurved, like the upper mandible of a parrot, over the small hyaline incurved 4-papillate apex, which is immediately subtended on the inner side by a small, erect, dark amber-brown, tooth-like process, the blunt tip of which alone is free. Appendages slender and extending to or beyond the tip of the perithecium. Spores about 20 × 2.5 μ. Perithecium average 70–75 × 30–32 μ not including the hook-like appendage, which is 25 μ to its upper margin. Receptacle: basal cell to tip of prolongation 90–220 × 15–22 μ, the portion above to tip of distal cell 48 μ.

On the right inferior anterior margin of the prothorax of *Cnemidotus 12-punctatus* Say. Cambridge.

This species which has been named for its discoverer, Mr. Charles Bullard, has been seen only on specimens of *Cnemidotus* from the vicinity of Fresh Pond. The peculiar development of the receptacle is associated with its position of growth on the anterior margin of the prothorax, over which it hangs by the monstrous basal cell. The position of growth is invariable and this invariability is here even more inexplicable than in other similar instances. The species appears to be very constant varying only in the length of the basal cell of the receptacle.

CHITONOMYCES PSITTACOPSIS Thaxter. Plate XXXIV, figs. 23–25.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 30. June, 1901.

Nearly hyaline. Receptacle rather slender, the basal cell several times as long as the squarish subbasal cell; the cell above the latter nearly equalling it in size and separated by an oblique septum from the lowest of the marginal cells, which are all subequal; the terminal appendiculate cell of the usual form, relatively large and long, without any distinct basal enlargement; the tip of the lower appendiculate cell curved slightly outward. Perithecium relatively very large, long, slender, usually curved sidewise throughout, the upper half tapering very slightly to the curiously modified, clear black contrasting tip, which resembles the parlty open beak of a parrot; a larger upper recurved mandible-like process being separated from a second, that resembles a lower mandible, by a hyaline area which includes, and extends back from, the pore; the lower lip-cells translucent, but suffused with brown in such a way as to suggest a tongue-like process projecting slightly between the "mandibles." Spores very numerous, completely filling the cavity of the perithecium, greatly attenuated, 85 × 2.5 μ. Perithecium 200 × 30 μ. Receptacle to tip of distal cell 140 μ. Total length to tip of perithecium 290–300 μ.

On the posterior legs of *Laccophilus proximus* Say. Lake Eustis, and Daytona, Florida.

This is one of the larger species of the genus and is clearly distinguished by its tip which resembles a parrot's beak and by its large size and slender habit. Two hosts were found bearing the individuals, in groups in the position indicated, which were conspicuous from their large size and contrasting color.

CHITONOMYCES JAVANICUS Thaxter. Plate XLII, figs. 37–38.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 307. July, 1905.

Foot relatively small. Basal cell of the receptacle small and narrow, its basal half or more suffused with dirty blackish-brown, above hyaline; subbasal cell longer than the basal, and of nearly the same diameter throughout; the three cells above it subtriangular, about equal in size, darker straw-colored, or pale amber-brown: the lower marginal cell of the distal portion of the receptacle narrow, clean cut, darker amber-colored; the lower appendiculate cell above it hyaline, small; the two remaining cells above and external to it, forming an opaque appendage, shaped like a knife-blade, its tip rounded outward from the inner side to an external blunt apiculus. Perithecium suffused below with pale amber-brown, long and slender, narrower opposite the insertion of the lower appendage, expanding slightly above it, the small hyaline apex curved inward and subtended externally by an erect, clear, dark amber-brown projection, hardly or not at all exceeding it; and on the inner side by a larger, broader, less deeply colored, spreading cell, which is curved toward the receptacle, the blackened portion of which projects about half its length above it. Total length to tip of perithecium 165–185 μ, to the tip of the black prolongation of the receptacle 180–200 μ, greatest width 22–25 μ. Perithecium 90–110 × 16 μ. Basal portion of the receptacle 75 μ, including the slender foot.

On the margin of the left elytron of *Laccophilus* sp., Java.

Reference has been made above to the correspondence between this species, *C. melanurus* and *C. marginatus*, both as to position of growth and general structure. It is most nearly allied to *C. melanurus*, although the conformation of the blackened termination of the distal part of the receptacle is quite different. The types were obtained from material in alcohol sent from Java by Rouyer, No. 1395.

CHITONOMYCES ORECTOGYRI Thaxter. Plate XXXIV, figs. 19–20.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 32. June, 1901.

Dull purplish, the cells thick walled and marked by faint transverse striations. The basal cell of the receptacle very small and hardly distinguishable, owing to an abrupt curvature just above the foot; the subbasal cell relatively large, distally narrowed, nearly the whole upper half of its posterior margin covered by a relatively large triangular cell, from which it is separated by a nearly vertical septum; this triangular cell is in contact distally with the ascigerous cavity and the base of the lowest marginal cell; the latter is very long, extending upward, its narrow extremity ending without enlargement opposite the blackened base of the inner appendage, lying between the latter and the tip of the perithecium; the lower appendiculate cell well defined, about two thirds as long as the subterminal cell, which projects slightly above and bears the free terminal appendiculate cell, which is hyaline, about equal to the lower in length, its inner margin nearly straight, its outer margin curved abruptly inward to the base of the obliquely distinguished, blackened, narrow, erect terminal portion, from which the appendage has been broken in the types. Perithecium relatively large, of nearly equal diameter throughout; the tip broad with a bluntly rounded apex; a short erect contrasting brown prominence formed by the left posterior lip-cell, toward the base of which the inner (anterior) lip-cells are curved in a characteristic fashion, so as partly to overlap it. Spores about 75 × 5 μ. Perithecium 125 × 36 μ. Receptacle 250–270 μ. Total length to tip of perithecium 255 μ.

On the superior surface of the tip of the abdomen of *Orectogyrus* (*Orectochirus*) *specularis* Aubé. Africa. Berlin Museum, No. 806.

As has been previously mentioned, this and the following species are at least aberrant, and probably should be placed in a genus by themselves. The spores of both seem to be abnormally placed in the asci, the short segment being uppermost, but it is not unlikely that, as in some other species, the base of the spore is shortest, and if this is the case it is probable that a terminal appendage of some length will be found in uninjured specimens. With the exception of species of *Laboulbenia* no other forms have been found on the Gyrinidæ. The label *Orectogyrus* appears to have been a slip for *Orectochirus*. The species is therefore misnamed.

Chitonomyces Æthiopicus Thaxter. Plate XXXIV, figs. 21–22.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 430. April, 1900.

Perithecium red-brown, darker on the inner side, with faint transverse striations, somewhat curved; the inner lip-cells producing at the left a blackish brown projection directed obliquely outward across the tip and resembling a canine tooth, the inner lip-cell on the left producing a much smaller, blackish, inconspicuous, tooth-like projection; the distal end of the lower marginal cell of the receptacle abnormally developed, bulging inward against and almost over-topping the subterminal appendiculate cell, the greater portion of the margin of this outgrowth nearly horizontal and extending from the apex of the perithecium to the insertion of the subterminal appendage which is sunk in an abrupt depression between it and the base of the terminal cell of the receptacle. Receptacle nearly hyaline, strongly curved throughout, consisting of a long basal and subbasal cell which appear to lie side by side for nearly their whole length, the lower marginal cell of the distal portion almost obliterated by the body of the perithecium, the subterminal cell large triangular, the terminal cell about as large, and separated from it by a nearly horizontal septum; wholly free, abruptly geniculate, the distal portion much narrower, erect and black (the tip broken), abruptly distinguished above an external bulge of the portion below it. Perithecia 128 × 40 μ, the tooth-like projection 18 μ. Receptacle to tip 275 μ, the basal and subbasal cells including the foot 140 × 35 μ. Total length to tip of perithecium 255 μ.

On elytra of *Orectochirus specularis* Aubé, Paris Museum, No. 100, Gold Coast, Africa.

Hydræomyces Halipli ~~Cnemidoti~~ Thaxter. Part I. p. 293

This species which is common on *Cnemidoti* in New England has also been obtained from an undetermined species of the same genus taken at Eustis, Florida. It remains the sole representative of the genus.

ENARTHROMYCES Thaxter. Part I. p. 276.

This very characteristic and remarkable genus is still represented by a single species, *E. Indicus*, which has been obtained from the following additional localities. On *Pheropsophus* sp., Hong Kong, Hope Collection, No. 239. In the Paris Museum on several undetermined species of *Pheropsophus* from Asia; on *P. Latovici* Asia, No. 56; on *P. marginalis* India, No. 118 bis; on *P. Yezoensis*, Ken-Si, China, No. 155; on *P. dipsicollis*, Cochin China, No. 114. In the British Museum; on *P. fuscicollis*, Java, No. 534. In the Sharp Collection; on *Pheropsophus* sp., from Japan. In the Berlin Museum on *P. parallelus* Dej., Senegal; on *P. Madagascarensis* Nossi Bé, Madagascar No. 1004; on *P. Kersteni*, Aruscha Kisuani, Africa, No. 998; on *P. marginatus* Dej., Africa, No. 999; on *P. fastigiatus*, Cape of Good Hope; on *Pheropsophus* sp., Ceylon, No. 1006. The generic type appears to be an isolated one, and in the Key I have included it in a section by itself, although it is closely related to the Peyritschielleæ.

MONOICOMYCES Thaxter. XXXV, [illegible]; XXXVI, 1–13; XXXVII, 1–[illegible]

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 412. April, 1900.

Receptacle consisting primarily of two superposed cells terminated by a sterile appendage which is variable in character and simple or branched: the subbasal cell producing one, typically two, or in some species several, branches or secondary receptacles, which may consist of one to many superposed cells and may be simple or branched; giving rise to antheridia and perithecia which may or may not be also associated with sterile appendages. The antheridium consisting of four tiers of paired cells, the lower pair forming the stalk, the cells of the two middle pairs producing each a pair of antheridia from their upper inner angles; those of the distal pair cutting off paired sterile cells which correspond to the paired antheridia below, and one or all of which give rise to variously developed, simple, cellular, terminal, sterile appendages: the four pairs of antheridia opening into a common central cavity which discharges between the sterile terminal appendiculate cells. Perithecium stalked.

This is one of the most peculiar and interesting of the genera of Laboulbeniaceæ and is extremely variable in the general structure and relations of the fertile branches or secondary receptacles; a variability which is well illustrated by the conditions seen in *M. St. Helenæ* and *M. Leptochiri*. The characters of the peculiar antheridium appear, however, to be quite constant in all the species; although, in a few instances, it seems possible that the two middle tiers of cells may produce more than four antheridia each. The curious sterile terminal appendages of this organ are also very variable in their development, both as to number and length, and the cells from which they spring are evidently homologous with the antheridia, which are separated in a similar fashion from the cells below. It will be observed that a more detailed study of these forms has necessitated important modifications in the original diagnosis.

The hosts of this genus all belong to the Staphylinidæ, a majority of the species occurring on the Aleocharini.

MONOICOMYCES HOMALOTÆ Thaxter. Plate XXXV, figs. 8–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 412. April, 1900.

Receptacle consisting of very small hyaline basal and subbasal cells, the basal cell of the primary appendage short and stout, more or less deeply suffused with blackish brown externally and at the base, the cell above it, bearing two or three branchlets in an antero-posterior plane, the primary (terminal and external) one short and externally suffused with blackish, the lower cell larger and distally inflated. Fertile branches normally two, when the individual is bilaterally symmetrical, rarely three, consisting of a single cell which bears distally an antheridium from its outer and a perithecium from its inner angle. Perithecium amber-brown, slightly asymmetrical, relatively very large, short and stout; the lower half greatly inflated, generally more so on the outer than the inner side; distally conical, the small tip not distinguished, usually abruptly truncate, the stalk-cell hyaline, narrowing to its base. Antheridium borne on a pair of rather short stalk-cells, the cells of the second tier somewhat smaller and angular, the cells of the third tier somewhat smaller than those of the second, but large and distinct, the paired appendiculate cells separated from the terminal tier, relatively large, all four generally bearing stout finger-like sterile appendages of unequal length. Spores about 35 × 3 μ. Perithecia including basal cells 100–120 × 30–35 μ, the stalk-cell 35–40 μ. Antheridia including stalk-cells (not the terminal projections) 70–80 × 30–35 μ. Sterile part of receptacle about 70 μ.

On *Homalota putrescens* Woll., British Museum, No. 412, Azores. On inferior surface of abdomen. On *Homalota* sp. and *Trogophlœus* sp. Intervale, N. H., and Kittery Pt., Maine.

The form occurring on *H. putrescens* in Britain is taken as the type of this species as well as of the genus. I have found not uncommonly, however, on small species of *Homalotæ* infesting decaying *Lactarii*, a smaller form (Plate XXXV, fig. 9), in which the measurements are not far from half those of the type, and which is usually distinguished by a dark suffusion at the base of the perithecial stalk-cells similar to that of *H. similis.* Large specimens of this form nevertheless occasionally occur, and correspond so closely to the type that I think they should not be separated.

Monoicomyces Brittanicus Thaxter. Plate XXXV, figs. 3–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 413. April, 1900.

Nearly or quite hyaline. General structure as in *M. Homalotæ*, the third cell of the primary appendage suffused with blackish brown, somewhat constricted below. Fertile branches consisting of a single cell bearing the antheridium and perithecium as in *M. Homalotæ*. Perithecium rather long-stalked, slightly asymmetrical or bent, the base inflated, tapering gradually to the blunt undifferentiated tip. Antheridium borne on a pair of rather long stalk-cells, the basal cells almost exactly similar to them and distally not enclosing any portion of the antheridial cavity, the wall cells well developed, the cavity within them relatively small, the terminal cells growing up into generally stout finger-like processes which may extend above the tip of the perithecium. Perithecium, including basal cells, 90 × 30 μ. Antheridia to base of terminal projections 80 × 20 μ.

On *Homalota insecta* Thom., British Museum, No. 454, Hammersmith, England. On superior surface of abdomen.

This species is too nearly related to *M. Homalotæ*, and may prove to be only a variety. It differs in its more slender form and apparently also in the characters of the primary appendage: but more abundant and better material is needed to determine to what extent these characters are constant.

Monoicomyces Echidnoglossæ Thaxter. Plate XXXV, figs. 5–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 23. June, 1901.

Subbasal cell of the receptacle somewhat smaller than the basal cell, bearing a terminal appendage the basal cell of which is as long, or nearly as long as the receptacle and often distally enlarged; the axis above it consisting of a curved series of several cells, externally opaque, black, hyaline along the inner margin, each cell giving rise from its inner side to a hyaline simple branchlet. Fertile branches usually two, sometimes one or three, arising from the subbasal cell of the receptacle, and consisting of a single short basal cell which bears directly a perithecium (in some cases more than one) and an antheridium. Antheridium relatively large, the stalk-cells somewhat longer and narrower than the cells of the middle two upper tiers more or less prominent distally: the cells of the distal tier proliferous externally and distally, thus forming an outer crown of shorter appendages of very unequal length, which surround the usual inner series. Perithecium becoming greatly and asymmetrically inflated below, and tapering rather abruptly to the slightly distinguished, rather short, bluntly pointed tip; the stalk-cell variably developed. Perithecia 100–125 × 45–55 μ, the stalk-cells 40–80 × 15 μ. Antheridia 75–100 μ, the sterile appendages 50–75 μ. Total length to tip of perithecium 220–250 μ.

On the inferior surface of the thorax of *Echidnoglossa Americana* Fauvel. Vera Pass, Colorado. Leconte Collection.

Although closely allied to *M. Homalotæ*, this species appears clearly distinguished by the proliferation of the last tier of cells of the antheridium, and the similar tendency of the penultimate tier, fig. 7.

Monoicomyces similis Thaxter. Plate XXXV, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 305. July, 1905.

Pale straw-colored. Receptacle consisting of two superposed cells, terminated by a straight tapering simple several-celled appendage, sometimes reaching to the tips of the perithecia, and distinguished by a black basal septum. The subbasal cell of the receptacle also giving rise to a pair of normally symmetrical branches, consisting of a single basal cell, from which arises the stalk-cell of the perithecium on the inner, and that of the antheridium on the outer side. Stalk-cell of the perithecium narrowed at the base, the narrow portion red-brown, expanding above and hyaline. Perithecium somewhat asymmetrical or bent, deeper straw-colored, tapering gradually to the blunt tip, which is hardly distinguished. Antheridium of the normal type, the distal appendages usually two, one sometimes exceeding the tip of the perithecium. Total length to tip of perithecium 150–200 μ. Perithecium 90–110 × 30 μ, the stalk-cell 35 × 46 μ. Spores about 35 × 4 μ.

On the abdomen of *Homalota* sp., infesting species of *Lactarius*, Kittery Point, Maine.

This is a rather rare species, occurring near the tip of the abdomen of one of the larger mycophilous *Homalotæ*. It is most nearly allied to *M. Homolatæ*, from which it differs in its slender form, large size and single primary appendage, which is distinguished at its base by a black septum. It is subject to some variation, the more normal form represented in the figures, being often modified through the production of only one perithecium or of more than two. The red brown suffusion at the base of the perithecial stalk-cells is also peculiar.

MONOICOMYCES NIGRESCENS Thaxter. Plate XXXVI, figs. 1–4.
Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 10. June, 1902.

Receptacle minute, its basal cell hardly distinguishable above the foot, bearing distally a simple appendage the basal cell of which is hyaline, the subbasal somewhat longer than those above and deeply tinged with blackish brown below. Fertile branches two or more, usually four, each consisting of a single cell which bears an antheridium terminally and a perithecium subterminally: the primary branches normally two, lateral and symmetrical, edged externally with blackish brown, the blackening contrasting and continuous with a similar coloration which extends to the tip of the primary antheridium: the secondary fertile branches arising, when present, between the primary and resembling the latter, except for the absence of the black discoloration; the whole group of branches forming, with their closely crowded antheridia and perithecia, a compact, fan-like, usually symmetrical tuft. Antheridia relatively long, suffused with smoky brown, more deeply blackish externally, the secondary ones with a more or less conspicuous foot-like blackened base; the stalk clearly two-celled, shorter than the main body; only two of the cells separated from distal cells growing upward to form two unequal terminal appendages, which are smoky brown, darker about their blackened basal septa, the cells immediately below them projecting upward very slightly on either side. Perithecia furnished with variably developed stalk-cells the bases of which are blackened, but which are otherwise hyaline, as is the rest of the rather short, often stout, subconical, bluntly pointed perithecium. Perithecia 60–75 × 22–25 μ; the stalk-cell 12–55 μ. Antheridia including stalk, 35 μ, the appendages 35–50 μ. Total length 100–160 μ.

At the tip of the abdomen of *Calodera* sp. and of *Tachyusa* sp.; Intervale, N. H., No. 1357; Kittery Point, Maine. The hosts frequenting fleshy fungi.

This species is not uncommon on minute staphylinids inhabiting decaying *Lactarii* and other fleshy fungi, but from its small size, dark color and flat appressed habit, it is difficult to find. It is possible that the secondary fertile branches arise as in *M. Aleocharæ* from the proliferation of the primary ones, but in some cases at least they seem to arise directly from the subbasal cell of the receptacle. The species is well marked and recognizable from its marginal suffusions.

MONOICOMYCES ALEOCHARÆ Thaxter. Plate XXXVI, figs. 5–7.
Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 24. June, 1901.

Pale amber, shading to amber-brown. Receptacle, together with the foot and the basal cell of the terminal appendage, forming a heart-shaped body, blackened below, bearing terminally the median, rigid, slender, almost wholly opaque, black continuation of the primary appendage which is abruptly distinguished from its broad basal cell: the subbasal cell of the receptacle small, triangular when viewed sidewise, giving rise to two fertile branches, the short small basal cells of which give rise at once each to two secondary branches and an antheridium; the branchlets proliferous and forming an axis of usually three cells, the lower bearing an antheridium, and each of the two upper an antheridium and a perithecium; there being thus sixteen antheridia and eight perithecia in fully and symmetrically developed specimens, which form a dense, spreading, fan-like tuft, the antheridia being in general posterior in position, overlapping one another between the black sterile appendage and the perithecia. Antheridium distally broadened and truncate, elongate; the stalk-cells about equal and about one half the length of the body of the antheridium or somewhat longer than this; the cells of the second tier somewhat unequal; the cells of the third tier smallest; the terminal cells prominently rounded distally, the appendiculate cells usually prominent, forming papillæ which are subtended by the appendages, all four of which do not always develop; these appendages relatively short, two to three-septate, tapering to a blunt point, distinctly inflated above the slightly constricted base. Perithecium relatively large, straight or slightly curved, somewhat inflated below, tapering gradually to the rather short, moderately well distinguished tip; the apex bluntly rounded, the basal cells relatively small; the stalk-cell variably developed, its distal end usually somewhat broader than the basal cells collectively, sometimes more than half as long as the body of the perithecium. Spores about 50–55 × 4–5 μ. Perithecia 130–185 × 35–55 μ, the stalk-cell 35–100 × 18–25 μ. Antheridia 70–75 × 22 μ, its appendages 45–50 μ. Receptacle about 35 × 28 μ. Greatest general length and width of largest individual 350 × 300 μ.

On *Aleochara rufipes* Boh., Derema, Usambara, East Africa. Berlin Museum, Nos. 844 and 845.

A very striking species remarkable for its method of branching and the large number of antheridia produced. The figure shows a well and symmetrically developed individual, but many produce but few antheridia and perithecia, and one of the primary fertile branches may be altogether lacking.

MONOICOMYCES OXYPODÆ Thaxter. Plate XXXV, figs. 11–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 10. June, 1902.

Receptacle very small, the two cells subequal, the basal cell involved by the blackening of the foot and hardly distinguishable; the primary appendage straight and tapering, its basal cell hyaline, nearly isodiametric; the subbasal cell brown, slightly inflated and twice as long; subbasal cell of the receptacle giving rise to a branch on either side; one usually sterile, short, blunt, extending externally above the subbasal cell of the primary appendage, and wholly blackened to its base: the other fertile; consisting of a single cell which is brown, broadly blackened externally, the blackening involving its narrow base almost completely; its distal half becoming more than twice as broad, and giving rise normally to a single antheridium terminally and a stalked perithecium subterminally on its inner side; stalk of the antheridium brown, two-celled equal in diameter to the branch-cell which bears it, and becoming like it externally blackened; the functional portion of the antheridium stout, distally rounded and slightly sulcate; one only of the cells separated from the upper tier growing out to form a colorless appendage. Stalk-cell of the perithecium arising immediately below that of the antheridium on the inner side, its narrow base black and opaque, resembling a "foot," distally hyaline, broader, about as long as the antheridium; the basal cells hyaline, rather small; the perithecium faintly purplish, rather long and narrow, relatively large, the tip rather abruptly distinguished and usually slightly bent. Spores 45 × 4.5 μ. Perithecia 75–90 × 18–20 μ. Antheridia 25–35 × 107 μ, the appendage 40–50 μ. Receptacle 10 μ, its appendage 75 μ. total length about 150–165 μ.

On the inferior tip of the abdomen of *Oxypoda* sp; Intervale, N. H., July 17, 1901.

This species, which is apparently very rare, since I have sought for it in vain since the single infested host was found, is certainly rightly placed in this genus, its chief peculiarity being the production of a short black infertile branch which appears to arise from the subbasal cell of the receptacle. It is difficult, however, to determine exactly the origin of either of these branches on account of the suffusion about the base. In one or two specimens the fertile branch gives rise to more than one perithecium or antheridium. The species is not related to *Kleidiomyus furcillatus*, the antheridium of which is of a different type. The host is a small staphylinid common in decaying vegetable refuse.

MONOICOMYCES ST. HELENÆ Thaxter. Plate, XXXVI, figs. 8–9.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 413. April, 1900.

Pale yellowish or straw-colored. Receptacle consisting of a triangular basal cell, and a squarish or roundish subbasal cell which bears a small distal cell with a short terminal appendage separated from it by a constricted blackish septum; two to four branches arise from the subbasal cell, normally fertile and consisting of from two to five, usually three, superposed cells which are commonly somewhat inflated distally, more so on one side, an upgrowth from which becomes separated so as to form a prominent small cell which lies close against the base of the axis-cell next above and is simple or usually longitudinally divided; in the former case bearing one, in the latter a pair of peculiar appendages distinguished by a conspicuously blackened septum; the basal cell of this appendage usually blackened externally or often wholly opaque the subbasal cell blackened externally about its characteristically geniculate base, its terminal portion erect suffused with brown, or hyaline, and either terminating the appendage or followed by two or three hyaline cells. Perithecium symmetrically inflated, slightly distinguished from the basal cells, the tip small straight truncate tapering but slightly and abruptly distinguished. The antheridium usually single on the fertile branch, replacing the characteristic sterile appendage at the base of the stalk-cell of the perithecium, relatively small, its stalk-cells and those of the second tier about equal; the antheridium proper about as large as the basal part and hardly broader, its terminal cells developing, as in the other species, long often flexuous hyaline upgrowths. Spores 38 × 3.5 μ. Perithecia 100–120 × 40–48 μ. The stalk 34–50 × 25–27 μ. Appendages of fertile branch 50–90 × 5 μ. Sterile part of receptacle 50–50 μ. Greatest length to tip of perithecium 250–435 μ.

On abdomen and elytra of *Oxytelus alutaceifrons* Woll., British Museum, No. 411, Island of St. Helena. On *O. piceus* Sim., Germany, and *O. luteipennis* Er., Algeria. Sharp Collection, Nos. 1170 and 1171.

This species suggests *Compsomyces* in general habit, and the secondary fertile branches undoubtedly spring directly from the subbasal cell of the receptacle. The sterile appendages of these branches are very peculiar in appearance and are not unlike those of *M. Leptochiri*, a species which appears to be its nearest ally.

MONOICOMYCES LEPTOCHIRI Thaxter. Plate, XXXIV, figs. 39–40.
Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 304. July, 1905.

Receptacle consisting of a main axis of superposed cells, usually long and slender, normally simple, sometimes once to several times branched, the whole structure apparently a branch from the subbasal cell of a small primary receptacle: the axis somewhat similar to that of *Rhachomyces*, consisting of a series of superposed cells, variable in number (about twelve to twenty-five), each of which bears on one side, so as to form a unilateral series, a pair of simple cylindrical few-celled appendages, which become better developed from below upward; arising side by side, closely associated and appressed, characteristically blackened at the base, which is usually indistinguishable from the small blackened cell from which they arise, and which is obliquely separated just below each septum of the axis: this opaque region in the lower cells of the axis, usually projecting characteristically like a notch or tooth: the cells of the axis near its base deeply suffused or opaque; the suffusion becoming, from below upward, gradually associated with the septum only: the axis in some specimens nearly hyaline throughout, with blackish-brown suffusions at or about the septa. The paired appendages replaced somewhat irregularly below the perithecium by antheridia of small size, resembling the appendages in general appearance when viewed laterally, and usually terminated by two hyaline simple appendages of no great length. Perithecium solitary, terminating the main axis, or its secondary axes; faintly yellowish, straight, slightly inflated, nearly symmetrical, rather abruptly narrower at the tip, the apex rather small, symmetrical, truncate. Total length to tip of perithecium 250–800 μ, the axis about 18–20 μ in diameter. Perithecium 70–90 × 18–25 μ. Longer appendages sometimes 50 μ.

On all parts of *Leptochirus unicolor* Cast., *L. Javanicus* Cast., *L. minutus* Cast., Java.

This anomalous and very peculiar species was at first mistaken for a new generic type, but so far as can be determined from the material, its antheridia are not different from those of other members of the genus, and the multiplication of the cells of the secondary axis or fertile branch, and the coincidence of the latter with the primary receptacle, which is in no way distinguished from it, are points of secondary importance. It resembles *M. St. Helenæ* more closely than perhaps any other species, the peculiar appendages being strikingly similar. The long and usually nearly opaque axis is very like that of *Rhachomyces*. The peculiar staphylinid hosts on which it occurs are sparingly clothed with long stout hairs or setæ, among which the parasite is often distinguished with difficulty. Specimens growing on the jaws, or other portions of the host where they are exposed to unfavorable conditions, often produce secondary fertile branchlets, as in fig. 40, but this condition is exceptional; the normal form, as it occurs on the abdomen or in other favorable situations, being similar to that represented in fig. 39, which is the type form. The axis, however, varies considerably in the number of cells which compose it and in the depth of its suffusions. The hosts are tropical insects living under bark.

EUMONOICOMYCES Thaxter. XXXVII 7-18

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 21. June, 1901.

Receptacle consisting of a basal and subbasal cell, the latter producing terminally a sterile appendage and laterally a fertile branch (abnormally more than one) the axis of which is coincident with that of the receptacle, from which it is not distinguished, and consists of a series of superposed cells; the terminal one bearing an antheridium and a stalked perithecium; the rest bearing antheridia or paired sterile appendages from their upper inner angles. The antheridia compound, borne on paired stalk-cells, and consisting of very numerous antheridial cells arranged in subhorizontal, or oblique tiers; the series separated externally by two superposed sterile cells, and opening into a common cavity from which the antherozoids are discharged by a common outlet between four appendiculate cells which terminate the antheridium and arise from the two primary terminal cells of the antheridium, as in *Monoicomyces*.

The only material from which it is possible to form an approximately accurate idea of the structure of the antheridium in this genus is that of *E. Papuanus*, the hosts of which were preserved in alcohol. Although the form is very small, careful examination with a $\frac{1}{16}$ oil immersion renders its general cell-arrangement sufficiently clear, notwithstanding the fact that from the irregularity of its outline and of the cells composing it, the different appearances that may be obtained from different points of view are very confusing. In the lateral view, fig. 15, which is practically the same on both sides, and is the one almost invariably seen in preparations where the individuals lie flat, the stalk-cell appears to be, as was stated in the original description, single. It can be determined, however, by careful focussing, or when a view anterior or posterior in relation to the fertile branch is obtained, that the stalk like that of *Monoicomyces*, is two-celled (fig. 16). Above this stalk the second tier of two cells is also present and from each of these, instead of a pair, as in *Monoicomyces*, two series of rows of antheridial cells are produced, one on either side. There are thus four such series in paired sets, one anterior and the other posterior, and having much the same appearance in either case, as in fig. 16, which is, however, turned slightly to the left, but shows the straight median line of demarcation which separates the two sets. Were this figure reversed, the opposite side would show much the same appearance and if viewed at right angles, either from the right or from the left, the appearance would in either case be similar to that shown in fig. 15. Each of the four sets, as may be seen by reference to fig. 16, in which one of the pairs is represented, consists of about five somewhat oblique rows, which correspond on either side of the straight median line; each row being composed of about five antheridial cells, the number being apparently subject to some variation, the bases of which are indicated in the figure. The method by which these rows of antheridia are separated, is seen more clearly in fig. 17 where only one set is visible, the antheridium in this instance, being younger and viewed more obliquely than in fig. 16, and turned from right to left. Fig. 16 viewed at right angles to its present position, whether seen from the right or from the left would have the appearance seen in fig. 15, in which the necks of the antheridia, toward the median line, are shown partly in optical section running obliquely upward. All the antheridia open by longer or shorter necks into a median cavity, as is shown in fig. 18 which is a not quite median optical section. This cavity seems to be single, and from it the antherozoids make their escape by a common aperture between the mouth cells, which as is Monoicomyces, are cut off from the third or upper tier of the main appendage, and which may later grow up into appendages as is shown in fig. 12. The somewhat dumbbell-shaped bulge of the upper tier-cells is somewhat exaggerated in fig. 15, which is somewhat confusing in that it combines a surface view with some of the appearances seen in optical section. The nature of the central cavity, whether a cell-cavity or an intercellular space, has not been determined in this or the preceding genus. This antheridium is the most highly developed organ of the kind in the whole group of Laboulbeniales there being perhaps seventy-five or more functional antheridial cells in each antheridium, but in the other species of the genus it is much less complicated; although, as far as can be determined from the insufficient material, the type is the same in all three.

Eumonoicomyces Papuanus Thaxter. Plate XXXVII, figs. 11–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 22. June, 1901.

Nearly or quite hyaline. Basal cell of the receptacle small, usually triangular; the subbasal cell terminating in a short appendage, distinguished by a dark basal septum, and sometimes once-branched. The fertile branch not differentiated from the receptacle, consisting of three, rarely two cells similar to the subbasal cell, obliquely superposed; the lowest bearing normally a closely approximated pair of short, hyaline or faintly brownish, erect, sterile appendages, similar to that of the subbasal cell; the middle cell smaller, bearing a single antheridium, and the upper an antheridium and a stalked perithecium. The antheridia rather stout, broader distally; the stalk-cell small and short; the antheridial cells very numerous, the terminal appendages of the usual type, short or seldom longer than the antheridium. Perithecium rather long and sometimes slender; the venter inflated; the distal portion tapering gradually and symmetrically to the blunt, nearly truncate apex; the rather short tip hardly distinguished above a slight elevation; the stalk-cell variable in length, rather slender, seldom more than half as long as the perithecium; the basal cells rather large and broad, not distinguished from the venter. Spores about 35 × 3 μ. Perithecia 80–120 × 32–40 μ, the stalk-cell 35–75 × 15 μ. Antheridia including stalk-cell and without appendages 35 × 18 μ. Total length to tip of perithecium 150–290 μ.

On all parts of a small pale *Oxytelus*? Ralum, New Pomerania. Berlin Museum, No. 1011.

Several hosts bearing this species were found among the alcoholic material brought by Dr. Dahl from the East Indies. The sterile appendages of the fertile branch, although they appear to be solitary when viewed from one side, are in reality paired, exactly like those of *Monoicomyces*. The terminal cell of the primary appendage is spinose as shown in fig. 13.

Eumonoicomyces Californicus Thaxter. Plate XXXVII, figs. 9–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 22. June, 1901.

Resembling *E. Papuanus* in general habit. Basal cell of the receptacle short, stout, geniculate, with a dark brown suffusion extending from the foot half-way up its convex margin; the subbasal cell bearing distally a long appendage consisting of a short hyaline basal cell, separated by a dark septum from a second cell above it, which is dark brown and bears two long, slender, one-celled, erect branches, brown below, becoming hyaline distally. The fertile branch not distinguished from the receptacle and consisting of three, sometimes more, very obliquely superposed cells similar to the subbasal cell: the lowest bearing a sterile appendage like that which terminates the receptacle; the middle cell usually bearing an antheridium, and the upper an antheridium and a perithecium. Antheridium short-stalked, with a more or less well-defined median constriction resulting from an inflation of the cells which bear the terminal appendages. The latter very long, brown, extending beyond the tip of the perithecium. Perithecium short and stout, the venter inflated, the much shorter neck-like distal portion abruptly distinguished, the apex blunt, the stalk-cell usually rather short and stout. Perithecia 75 × 25 μ, the stalk-cell 20 × 18 μ. Sterile appendages, longest 150 μ. Appendages of antheridium 100 μ. Total length to tip of perithecium 150 μ.

On *Oxytelus* sp. Berkeley, California.

The antheridia are so placed in the specimens of this species which have been examined, that it has been impossible to determine the details of their structure, which are further obscured by the irregularities and relatively considerable development of the appendiculate cells. The species is distinguished from the others by its dark sterile appendages, as well as by other points of difference.

EUMONOICOMYCES INVISIBILIS Thaxter. Plate XXXVII, figs. 7–8.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 21. June, 1901. *Monoicomyces invisibilis* Thaxter, l. c. Vol. XXXV, p. 414. Apr., 1900.

Hyaline. Basal cell of receptacle small subtriangular, the subbasal cell rather long and narrow, bearing terminally a distally rounded cell from which it is separated by an oblique septum and which is surmounted by a short simple cylindrical appendage; the fertile branch developed on one side only, not distinguished from the receptacle and its appendage, consisting of two or three obliquely superposed cells extending obliquely upward in a divergent series, the terminal cell bearing a perithecium and antheridium in the usual relative positions, the subterminal cell sometimes apparently producing a second antheridium instead of the simple paired appendage which terminates the lower cell of the series. Perithecium borne on a rather short stout stalk-cell, its inflated basal half not distinguished from the flattened basal cells, its slender distal half abruptly distinguished. Antheridium apparently similar in general to that of the other species. Perithecia 84 × 30 μ. The stalk-cell 20 × 10 μ. Receptacle, sterile part, about 40 μ. Total length to tip of perithecium 110–140 μ.

On *Homalota putrescens* Woll., British Museum, No. 412, Azores.

This species is so minute and so inconspicuous from its pale color, that it would almost inevitably be overlooked on dried hosts. One or two additional specimens were accidentally obtained in the Sharp Collection from scrapings of various species of *Homalota*. In none of the individuals, however, can the detailed structure of the antheridia be made out.

HAPLOMYCES Thaxter. Part I. p. 269

The genus *Bledius*, on which all the species of *Haplomyces* have thus far been found, is not well represented in the various collections examined, and no additional species have been discovered.

Haplomyces Texanus Thaxter, or a form indistinguishable from the type of this species in which the base of the appendage is black, has been found on the following hosts: *Bledius bicornis* Germ., Hope Collection, No. 213; no locality: *B. subterraneus* Erichs., Hope Collection, No. 220, Prussia: *B. opacus* Blk., British Museum, No. 448, Isle of Wight: *B. bicornis* Germ., British Museum, No. 432, "Europe": *B. juvencus* Erichs., Berlin Museum No. 841. A broken specimen on *B. obtusus* (Sharp Collection No. 1176) may perhaps also belong to this species. Whether this apparent form of *Texanus* should be considered identical with the short stout dark *H. Californicus*, and whether *H. Texanus* itself is more than a variety, I am unable definitely to decide without examining more abundant material. The types of *H. Californicus* are, however, numerous and in good condition and show no variation from the characters represented in my Monograph, Plate VII, figs. 1 and 2.

EUCANTHAROMYCES Thaxter. I. p. 273

Nine species have been added to this genus since the publication of the type-species *E. Atrani*, which probably illustrate the possible variations of its members more or less fully. The type of structure is a very constant and simple one; and, apart from certain differences in the cell relations, the modifications of the perithecial wall-cells and the conformation of the perithecial tip, the characters which appear to be most reliable in distinguishing species are found in the antheridium. The number of rows of antheridial cells, and the number of cells in each row, are apparently very constant; variations in these respects, in a given species, occurring rather exceptionally. In some forms the antheridium may be the most complicated male organ that occurs in the whole group, with the exception of that in *Eumonoicomyces* and possibly in some forms of *Haplomyces*; since, as in *E. Catoscopi*, there may be over fifty antheridial cells in a single antheridium. In certain other species, nevertheless, this number may be reduced one half or more, as in *E. Euprocti* or *E. spinosus*.

The structure of the antheridium appears to correspond in general to that of most of the other compound types. The antheridial cells are obliquely disposed in rows, usually three, more rarely four or even five, on either side; and their bases being external, they empty by short necks into an interior cavity, which connects directly with an efferent tube, through which the antherozoids are discharged in large numbers. The structure is closely comparable with that of *Haplomyces*, in which, however, the antheridia, not being separated by a sterile external marginal cell, surround the antheridial cavity completely.

An examination of Plate XXXVIII will show that there is a monotonous sameness among the species, which renders a very careful comparison of characters necessary in order to distinguish them. It should be noted that the spores, in many of the species at least, are peculiar in possessing a bluntly rounded apex, in place of the usual acuminate tip. The inner lip-cell is in general more or less distinctly modified, usually also more deeply colored, forming in many instances a more or less characteristic rounded prominence, as in figs. 28 and 36. The characteristic spine which persists in some species at the tip of the antheridium (Figs. 10 and 19) represents the apex of the spore, and is primarily terminal, as in *Stigmatomyces*, where it is almost invariably present. The ascogenic cells may be somewhat peculiar and in some species numerous. In *E. Catascopi*, for example, as is indicated at the base of the perithecium in fig. 13, they are long erect subclavate and at least eight in number; while in some of the smaller species there do not appear to be more than four, or possibly two, in some cases. The species appear to be very generally distributed and the hosts are in all instances beetles belonging to the Carabidæ.

EUCANTHAROMYCES SPINOSUS Thaxter. Plate XXXVIII, figs. 17–20.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 416. April, 1900.

Perithecium straw-colored, rather stout, inflated, tapering to the broad asymmetrical tip which is slightly sulcate; the outer lips often larger than the inner, the latter more deeply colored and not very conspicuous; the stalk-cell rather short. Receptacle short, the cells nearly equal. Appendage much as in *E. Diaphori*, more slender, the marginal cell extending nearly to the base of the subbasal cell, distinctly enlarged below a terminal spine-like process, which is usually nearly erect; the antheridial cells in three rows of five, three (relatively large) and one to two cells respectively, the discharge tube large and broad, nearly truncate, bent abruptly upward from the base. Spores 35–40 × 3.5–4 μ. Perithecia 138 × 41 μ. Appendage 70 × 14 μ, the antheridium 35 × 16 μ. Receptacle 50 × 20 μ. Total length to tip of perithecium 190–207 μ.

On elytron of *Drypta* sp., Paris Museum, No. 80. Java. On *Drypta lineola* Dej., Hong Kong; Berlin Museum, No. 950.

The antheridium in this species is perhaps the simplest thus far observed in the genus, the cells of the third row being apparently functionless and variable in form and number (one to three). The terminal spine stouter and larger, as a rule, even than that of *E. Diaphori*, the antheridium of which is otherwise very different. From its small size and pale color it is distinguished only with the greatest difficulty on the elytra of its host when dry.

EUCANTHAROMYCES EUPROCTI Thaxter. Plate XXXVIII, figs. 27–30.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 417. April, 1900.

Perithecium straw-colored to pale amber-brown, slightly asymmetrical, somewhat inflated below; the upper half tapering gradually to the blunt asymmetrical apex, the inner lip-cell rounded flat darker amber-brownish slightly prominent; the outline of the mature perithecium becoming more or less corrugated through the appearance of three to five rather broadly rounded successive elevations, corresponding to the distal and basal septa of the two lower tiers of wall cells, and to a median protrusion of these cells, where five are present; stalk-cell becoming slender, mostly slightly shorter than the receptacle; the basal cells small. Receptacle relatively rather long, the cells nearly equal. Appendage generally longer than the receptacle, its basal and subbasal cells nearly equal; antheridial cells in three rows of five, three, and two cells each, the marginal cell bluntly rounded above and extending nearly to the base of the subbasal cell; the discharge-tube large, bent outward or obliquely upward. Spores 50 × 4.5 μ. Perithecia 160–170 × 48 μ, stalk-cell 70 × 15 μ. Receptacle 85–90 × 25–30 μ. Appendage 110 μ, antheridium 41 × 22 μ, the discharge-tube 30 μ. Total length to tip of perithecium 310 μ.

On *Euproctus quadrinus* Bates, British Museum (Biologia Coll.), No. 731. Volcan de Chiriqui, Panama.

A few individuals of this species were found at the base of the eltyra of the host. It is well marked by the abrupt distinction between the base of the perithecium and its stalk-cell, by the broad tip and stout somewhat irregular form of the latter, and by the small number of the antheridial cells.

EUCANTHAROMYCES ATRANI Thaxter. Plate XXXVIII, figs. 1–3.

Additional material of this species has been obtained on specimens of *Atranus pubescens* from Washington, D. C., and from Kansas, in the collection of the U. S. National Museum. As this material is very much better than the types, both of which were immature or injured, additional figures are given herewith. The antheridium appears to be constant in structure, the rows of antheridial cells containing 6 (rarely 5), 4 and 3 cells respectively, the species is otherwise ill defined and without distinctive peculiarities. The antheridium may be distinguished by a slight terminal apiculus. It should be noted that the marginal cell of the antheridium is not septate above, as represented in Plate VII, fig. 27, of my Monograph.

EUCANTHAROMYCES CALLIDÆ Thaxter. Plate XXXVIII, figs. 31–34.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 418. April, 1900.

Perithecium rather narrow, slightly inflated, tapering from about the middle to the blunt tip which is rather abruptly distinguished externally, sometimes bent outward, its distal margin outwardly oblique; the inner lip-cell relatively small, projecting slightly externally, but not abruptly distinguished on its inner side; the outline of the perithecium becoming inconspicuously corrugated through the presence of sometimes as many as eleven successive elevations; the basal cells elongated, the base of one of the outer external to the stalk-cell from which it is separated by an oblique septum longer than the width of the stalk-cell which is narrower below and about equal to the basal cells in length, or somewhat shorter. Receptacle symmetrically sulcate distally, rather long, the two cells nearly equal. Appendage rather long, its basal cell extending downward and lying external to the upper half of the subbasal cell of the receptacle; the subbasal cell more than twice as long as broad, the marginal cell reaching to its base and distally prominent. Antheridium relatively small, the antheridial cells in three rows of five (six in one instance), four, and three cells respectively, the discharge-tube rather short and stout, erect or bent but slightly. Spores 40 × 4 μ. Perithecia 230–265 × 50 μ, basal cells 120 μ, stalk-cell 103 μ. Receptacle 100–120 μ. Appendage 120–125 μ, antheridium 25 × 38 μ. Total length to tip of perithecium average 325 μ.

On *Callida* sp., Paris Museum, No. 68, Venezuela; on *Callida tristis* Brullé, Berlin Museum, No. 974, Surinam.

A species distinguished by its generally slender habit, the large well distinguished tip of the perithecium and the parallelism between the stalk-cell of the appendage and the two cells of the receptacle. The figures are both drawn from the original types from Venezuela.

EUCANTHAROMYCES AFRICANUS. Plate XXXVIII, figs. 35–38.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 418. April, 1900.

Very similar to *E. Callidæ*. Amber-brown. Perithecium large subfusiform, the margins generally more or less distinctly corrugated, often marked by fine transverse striations which may be wholly absent, the tip relatively small and rather abruptly distinguished, the inner lip-cell well defined, projecting beyond the other lip-cells so that the apex usually appears oblique, asymmetrical and slightly sulcate; the basal cells somewhat shorter than the stalk-cell, their lower septa nearly equal and symmetrical, both slightly oblique. Receptacle of medium size, the basal cell distally enlarged lying beside the subbasal cell and extending to the stalk-cell of the perthecium. Appendage short, the two basal cells rather small and nearly equal in length, consisting of three rows of six, four, and four cells respectively, the discharge-tube slightly curved, abruptly nearly erect, distally somewhat narrower and conical when young, the marginal cell extending nearly to the base of the subbasal cell. Spores 48 × 5 μ. Perithecia 275–325 × 45–50 μ, the stalk-cell 100–130 μ, the basal cells 75–100 μ. Receptacle 100 × 26 μ. Appendage 100 μ. Antheridium 45 × 21 μ, the discharge tube 21 μ. Total length to tip of perithecium 575–600 μ.

On *Callida Natalensis* Hope, Hope Coll. No. 274, Natal, Africa. On *Callida* sp., Brit. Museum, No. 550, Angola, Africa. On elytra.

This species, which is closely allied to *E. Callidæ* may be distinguished by the different number of antheridial cells in its antheridium, the stalk-cell of which is differently related to the receptacle, as well as by the different relation which the stalk-cell bears to the basal cells of the perithecium. The latter also has a characteristic fusiform outline from the stalk-cell to the tips. Both figures are taken from the Natal material.

EUCANTHAROMYCES MADAGASCARENSIS Thaxter. Plate XXXVIII, figs. 24–26.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 306. July, 1905.

Rather pale straw-colored. Perithecium large, subcylindrical, tapering very slightly distally and basally, the rounded tip rather abruptly distinguished, and subtended by more or less distinct elevations; the trichophoric cell short, prominently rounded, but not extending beyond the lip-cells and rendering the apex subsymmetrical; the base not differentiated from the body of the receptacle, the cells relatively short, not extending down beside the stalk-cell, from which they are rather clearly distinguished: stalk-cell elongate, tapering below. Basal and subbasal cells of the receptacle of about equal length, the former about half as broad as the latter, and extending to the base of the stalk-cell of the perithecium. Basal cell of the appendage somewhat larger than the subbasal, slightly overlapping the subbasal cell of the receptacle, the marginal cell not prominent below the discharge-tube which is curved outward, sometimes horizontally; the antheridial cells in three rows of seven, seven, and five cells respectively. Spores about 60 × 4 μ. Perithecium, including basal cells, 385 × 60–70 μ, the stalk-cell 275–290 × 40–55 μ. Receptacle 165 × 35–45 μ. Antheridium, total length 130–150 × 30–35 μ, above basal cell 75 μ.

On elytra of *Callida* sp., Madagascar; Hope Collection, No. 273.

The material of this species being very old has only regained its turgescence after the prolonged action of glycerine. It appears to be unlike any of the other species on *Callida*, and next to *E. Catascopi*, is the largest known form. It is distinguished by its slender form, the elongate stalk-cell of its perithecium, the tip of which is abruptly distinguished, and by the characters of its antheridial appendage.

EUCANTHAROMYCES CASNONIÆ Thaxter. Plate XXXVIII, figs. 4–6.7

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 417. April, 1900.

Perithecium relatively large, rather long, often slender, inflated below, tapering to the relatively narrow blunt apex; its outline corrugated through the presence of from seven to eleven elevations varying in prominence some of which may become transversely striate at maturity, the basal cells elongated and as long or nearly as long as the rather stout stalk-cell. Receptacle relatively small. The basal and subbasal cells of the appendage relatively small and stout, nearly equal, or the latter somewhat smaller, the marginal cell bordering its upper half and distally prominent, partly free and slightly inflated, ending in a short spine-like tip; the antheridium consisting of three rows of nine, seven and five cells respectively, the discharge-tube relatively short and stout, bent upward and over the prominent tip of the marginal cell. Spores 45 × 3.5 μ. Perithecia 240–260 × 45–62 μ, stalk-cell 75–80 × 20–28 μ, basal cells 75–100 × 25–30 μ. Receptacle 55–65 × 27 μ. Appendage 85–103 μ, the antheridium 50–60 × 24–28 μ. Total length to tip of perithecium 375–450 μ.

On *Casnonia subdistincta* Chaud., British Museum (Biologia Coll.), No. 704. Cordova, Mexico.

Allied to *C. Africanus* which it resembles in general form, but from which it is at once distinguished by the characters of the appendage.

Eucantharomyces Catascopi Thaxter. Plate XXXVIII, figs. 13–16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 419. April, 1900.

Straw-colored becoming pale amber-brown. Perithecium elongate, tapering but slightly toward the tip, or becoming distally swollen through the pressure of the spore mass, the margins corrugated through the presence of sometimes as many as seventeen or even more prominences, which are mostly well defined, especially the distal one of the series and often distinctly rough-granular, above which the slightly bent tip is abruptly distinguished, its distal margin straight oblique, the outer and lateral lip-cells extending just beyond the small darker inner lip-cell; basal-cells very much elongated and often corrugated through the presence of six or more elevations; the stalk-cell rather stout, much shorter than the basal cells, from which it is separated by an outer very oblique, and an inner short nearly horizontal septum. Receptacle relatively small, the basal cell longer than the subbasal cell, distally enlarged so that it almost coincides with the base of the stalk-cell, which is thus hardly in contact with the subbasal cell from which it was originally derived. The basal cell of the appendage somewhat smaller than the subbasal cell, the marginal cell bulging outward slightly distally, and extending almost to the base of the subbasal cell. Antheridial cells in five rows of eight, seven, six, five, and four cells, or the four inner rows somewhat variable. Spores 50 × 4.5 μ. Perithecia 400–475 × 60–70 μ, the stalk-cell 140–200 × 35–40 μ, the basal cells 200–240 μ. Receptacle 100–110 × 38 μ. Appendage 120 μ; antheridium 60 × 32 μ. Total length 680–950 μ.

On *Catascopus* sp., Paris Museum, No. 117. Iles des Moluques. On the margin of the right elytron.

The largest and most striking species of the genus, the corrugated elevations of the perithecium, although sometimes partly obliterated by the copious spore formation, serving to distinguish it, apart from its other peculiarities. The ascogenic cells are remarkable from their subclavate form, at least eight being arranged in a rosette, as is indicated in fig. 13.

Eucantharomyces Diaphori Thaxter. Plate XXXVIII, figs. 8–12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 416. April, 1900.

Pale straw-colored. Perithecium rather short and stout, its basal cells small, slightly and usually symmetrically inflated; tapering slightly from about the middle to the broad blunt slightly asymmetrical tip, the flat inner lip-cell, small, lateral, and subterminal, bearing distally a slender recurved rigid appendage (not cellular) about 8–9 μ long. Receptacle rather short and stout, the subbasal (anterior) cell somewhat stouter than the basal, the two together somewhat larger than the short stalk-cell of the perithecium. Appendage relatively large, its basal cell short subtriangular, the upper and lower septa oblique, the subbasal cell slightly longer than broad, its upper two thirds bordered by the marginal cell which terminates in a slender stiff straight spine-like process about 11–12 μ long and slightly divergent; the antheridial cells in five rows of five, four, three, three, and two cells respectively; a single additional cell sometimes persisting above the antheridial cavity; the discharge tube bent outward and slightly upward, the tip bluntly conical with a slight basal enlargement. Spores 40 × 3.5 μ. Perithecia 120 × 30 μ. stalk-cell 30 × 18 μ. Appendage 70 μ long, the antheridium 28 × 21 μ. Receptacle 45 × 24 μ. Total length to tip of perithecium 180 μ.

On mid-elytron of *Diaphorus tenuicornis* Chaud., British Museum (Biologia Coll.), No. 714, Oaxaca, Mexico.

This species is represented by three or four individuals in good condition and is distinguished by its antheridial appendage, as well as by the short recurved appendage which subtends the tip of the perithecium on the inner side and appears to arise from the inner lip-cell, which is lateral and overtopped by the three others which appear to form the whole apex. This appendage may represent the indurated base of a trichogyne, the position of which in this genus may be unusual, but I have no available material which can determine this point. The terminal spine of the antheridium is long and conspicuous. In one specimen there seem to be only four rows of antheridial cells of five, four, four and three cells each.

Eucantharomyces Xanthophææ Thaxter. Plate XXXVIII, figs. 21–23.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 26. June, 1901.

Perithecium (not fully mature) straw colored, somewhat asymmetrical, almost symmetrically and but slightly inflated from base to apex; the tip short, well distinguished; the lip-cells rounded, and slightly inflated, forming a knob-like termination, one of them (the inner) protruding in the form of a slight tongue-like projection beyond the others: the stalk-cell about as long as the receptacle, from which it projects at an angle, being moreover turned at the same time a little to one side. The cells of the receptacle subequal, lying side by side, the basal one extending to the base of the stalk-cell of the perithecium, with which it is in contact. Appendage relatively large, the stalk-cell subtriangular, somewhat larger than the basal cell which is wholly overlapped externally by the well defined and distally somewhat inflated marginal cell; the antheridial cells in four tiers of seven, six, five and four cells respectively; the discharge-tube long and curved outward. Spores about 36 × 4 μ. Perithecia 165 × 50 μ, the stalk-cell 46 × 20 μ. The appendage to tip of discharge-tube 120 μ, the antheridium proper 55 × 30 μ. Total length to tip of perithecium 290 μ.

On the right inferior margin of the prothorax of *Xanthophœa vittata* Dej., Australia. Berlin Museum, No. 973.

The material of this species consists of but two specimens in which the perithecium is not quite mature. It cannot, however, be confused with either of the other species in which there are more than three rows of antheridial cells.

KLEIDIOMYCES Nov. Gen. XXXVII. 3-4

Receptacle consisting of two superposed cells, the basal cell (in the type) producing two characteristic outgrowths, the subbasal giving rise to antheridial appendages and to perithecia. The appendage consisting of a stalk-cell followed by a pair of cells with which a small compound antheridium is associated distally, the appendage ending in a free cellular extremity above the antheridium. The stalked perithecium similar to that of *Monoicomyces.*

This genus, which has been named from the resemblance which its peculiar outgrowths bear to a "wish bone," certainly cannot be retained in *Monoicomyces,* to which the single species was originally referred provisionally, since the antheridia in the two cases are quite different. The appendage, represented in fig. 4 of the accompanying plate, was obtained by crushing one of the three available specimens, and although little beyond the projecting lateral discharge-tube can be made out in detail, the other characters of the organ are sufficiently evident. The sterile termination appears to consist of three coherent rows of small cells, and in the type (fig. 3) two of these appendages are produced in addition to the perithecium. The peculiar outgrowths above referred to, which are so characteristic in the type are probably without significance generically, and are entirely comparable to the single outgrowth which arises from the basal cell in *Corethromyces Stilici.*

Kleidiomyces furcillatus nov. comb. Plate XXXVII, figs. 3–4.

Monoicomyces furcillatus Thaxter, Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 24. June, 1901.

Receptacle consisting of two small cells which are hardly distinguishable owing to a general blackish brown suffusion; producing on either side, from the basal cell, a stout blackened outgrowth, the two forming a nearly symmetrical fork-like structure, the prongs of which are slightly curved inward and slightly divergent. From near the base of these outgrowths, and between them, arise, apparently from single basal cells on either side, stalked perithecia and appendages. Antheridial appendage rather slender, shorter than the perithecia. Perithecia long and slender, straight, symmetrical, pale yellowish, slightly inflated toward the base, tapering gradually to the blunt apex. Spores about 40 × 3 μ. Perithecia 135 × 27 μ. Outgrowth from the receptacle 110 × 12 μ.

Near the tip of the abdomen of *Aleochara repetita* Sharp. Panama, Sharp Coll., No. 1095.

Only one of the three individuals obtained is in fairly good condition, but the species is so very peculiar in appearance that it can hardly be mistaken for any other form. Owing to the great reduction of the receptacle and its deep suffusion, it has not been possible to determine absolutely the exact origin of the fork-like outgrowths which seem to come from the basal cell, as in *Corethromyces Stilici.*

EUHAPLOMYCES Thaxter. XXXVII. 19-21

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 25. June, 1901.

Receptacle consisting of two cells, the upper bearing a free stalked antheridium and a stalked perithecium. Antheridium conical, consisting of a single stalk-cell followed by a basal cell from which is separated a group of smaller cells some of which (two or four?) extend upward and inward to form antheridial cells: above these follow three external marginal cells, the lowest of which lies beside the antheridial cells; the uppermost succeeded by a conical chamber which terminates in a pore, and extends downward along the inner sides of the marginal cells to form a cavity into which the antheridial cells empty. Perithecium resembling that of *Haplomyces* in the type.

This genus appears to be somewhat closely related to *Haplomyces, Cantharomyces* and *Camptomyces*, but the structure of its antheridium is essentially different from that of either of these genera. The number of antheridial cells is small, not more than four or five, and it is somewhat difficult to distinguish them from the adjacent sterile cells. The passage for the discharge of the antherozoids seems to be formed by the disorganization of more than one cell, and as may be seen in fig. 21 lies on the inner (left) side of certain sterile cells; but distally occupies the whole tip. The antheridial cells, as indicated, converge to the base of this cavity and empty into it, but this is shown in one instance only in the figure.

EUHAPLOMYCES ANCYROPHORI Thaxter. Plate XXXVII, figs. 19–21.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 25. June, 1901.

Receptacle small, the basal cell somewhat longer, nearly hyaline, tapering to the relatively small foot; the subbasal cell becoming pale amber-brown. Antheridium, including its short stalk-cell, about as long as the receptacle, becoming pale amber-brown, tapering to a pointed apex. Perithecium becoming pale amber-brown, relatively large, thick-walled, considerably and abruptly inflated above the basal cells, somewhat asymmetrical, tapering rather evenly to the blunt apex; the stalk-cell long, thick-walled, slightly curved, nearly hyaline, distally somewhat broader, not distinguished from the basal cells. Spores about 40–45 × 3.5 μ. Perithecia 180–200 × 72–82 μ; the stalk-cell 110–120 × 28–30 μ. Antheridium, including the stalk-cell, 55–65 μ. Total length to tip of perithecium 360 μ.

On the superior surface of the abdomen of *Ancyrophorus aureus*. Dumfriesshire, Scotland, Sharp Collection, No. 1091.

CANTHAROMYCES Thaxter. XXXVII. 5-6 I. p. 271

A single British species has been added to this genus which is evidently most closely allied to *Haplomyces* and *Eucantharomyces*. No further data have been obtained in regard to the distribution of the species, except that the range of *C. pusillus* is extended to Florida, where specimens were obtained on the margin of Lake Eustis, at Eustis. Specimens of *C. Bledii* were also obtained in the collection of the National Museum on *Bledius annularis* Lec. from Iowa, and on *B. nitidicollis* Lec. from Michigan.

The generic type is a clearly defined one, but the species are very variable in respect to the number of antheridial cells in the lateral group, which is characteristic in all cases. An extreme case of this variation is seen in the species described below, in which the antheridium proper is made up of perhaps not more than three or four cells.

CANTHAROMYCES PLATYSTETHI Thaxter. Plate XXXVII, figs. 5–6.

Proc. Am. Acad. Arts. and Sci., Vol. XXXV, p. 415. April, 1900.

Yellowish with a brownish tinge. Receptacle consisting of a small basal cell and a subbasal cell more than twice as large, bearing the perithecium and appendage. Perithecium borne on a rather long stalk-cell, the basal cells continuous with its main body which is inflated below, conical above, the narrow apex truncate or bluntly rounded. The appendage large, its subbasal cell nearly twice as long as the basal, bearing the very small antheridium which forms a short cellular margin below its upper inner angle and apparently consists of not more than ten cells; the subbasal cell terminated by an irregular series of small cells which appear to produce a tuft of branches distally, and from which it may sometimes be separated by a third cell similar to it. Perithecia 80–86 × 35 μ. The stalk-cell 55 × 20 μ. Receptacle 50–70 × 28 μ. Appendages 140–170 μ.

On abdomen of *Platystethus cornutus* Grav., British Museum, No. 449, Kilburn, England.

This species is most nearly related to *C. occidentalis* which it closely resembles in general form. It is distinguished, however, by the greatly reduced antheridium, which can sometimes hardly be made out in mature specimens, as well as by the distal enlargement of the basal cell of the appendage. The material of this species is unfortunately scanty and in poor condition, the sterile terminal branches of this appendage being broken off in every case.

LABOULBENIACEÆ.

Genera monœcious or diœcious, the antheridia simple, clearly differentiated, solitary or grouped, free or adnate, but discharging their sperm-cells independently.

HERPOMYCES Thaxter. Pl. 39–41

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 11. June, 1902.

Sexual organs normally separated on different individuals. Antheridia simple.

Male individual consisting of several (four) superposed cells terminated by a characteristically modified spinous, or by a small foot-like process, or by both; the basal cell attached by a small normal blackened foot: one or more of the distal cells giving rise to short branches which may bear from one to several antheridia terminally, or become more or less copiously branched; the branchlets terminated by antheridia, or in some cases sterile. Antheridia long, flask-shaped. The subbasal cell of the receptacle sometimes producing a fertile branch, as in the female individual, from which are produced secondary receptacles which give rise to antheridial branches.

Female individual consisting primarily of several superposed cells similarly modified at the tip, and attached by a small normal foot; the basal and subbasal cells constituting a "primary receptacle," the latter giving rise to a variably developed fertile branch (sometimes apparently dividing to several cells, each of which may produce a fertile branch) from which is developed a single "secondary receptacle," or, as a result of branching, more than one. Secondary receptacles consisting of a partly double series of cells, variable in number, one or more of which may be fertile, the rest sometimes specially differentiated, or unmodified; those in contact with the host, perforating the chitinous integument by means of fine haustoria. Trichogynes short filamentous simple or sparingly branched. Perithecium borne on variably developed stalk-cells, the ascigerous portion including three tiers of wall-cells, more or less clearly distinguished from the distal portion, the wall-cells of which are more or less differentiated, four or five in each row. Spores minute, of the usual type, normally discharged in pairs the members of which produce male and female individuals. Asci apparently eight-spored?

The discovery of this remarkable genus is due to Mr. Charles Bullard, who first observed it on *Ectobia*. It is unlike all others thus far described from the fact that, in all the species, one or both of the sexes produce secondary receptacles, corresponding to the fertile branches of other genera, which, instead of growing free and depending on the primary foot for their nutrition, attach themselves to the host and become quite independent as far as their food-supply is concerned. Both the primary foot, and the cells of the secondary receptacle, which are in contact with the host, penetrate the latter by means of a simple cylindrical slender rhizoids, readily visible, especially in forms which grow, or begin their growth, as is more often the case, on the usually transparent spines or bristles projecting from the integument of the insect (Plate XXXIX, figs. 3–4, and XLI, fig. 8).

In nearly all cases the original infection appears to take place on one of these bristles, and here, as in other diœcious species, the spores are normally discharged in pairs, the members of which develop side by side (Plate XLI, fig. 17), and grow into male and female individuals respectively (fig. 14). In some species both individuals complete their development on one of these bristles as in *H. chætophilus*, fig. 14; but, in a majority of cases, a fertile branch from the subbasal cell of the primary receptacle of the female, grows downward till it reaches the host's integument, before any production of perithceia begins. More frequently this fertile branch becomes furcate as soon as it leaves the bristle, the two secondary branches being transformed into secondary perithecigerous receptacles, and in several species two paired perithecia are thus produced, one from each of the secondary receptacles, symmetrically placed at the base of the spine (Plate XXXIX, fig. 9, and Plate XLI, fig. 2). In other cases the secondary receptacles are more highly developed, creeping rather extensively, but never branching, and always growing through the activity of a single terminal cell. Such multicellular secondary receptacles may give rise to numerous perithecia, and this type arrives at its highest development in forms like *H. Ectobiæ* (Plate XXXIX, figs. 11–12) and in *H. tricuspidatus* (Plate XL, fig. 13). In some forms, also, the secondary receptacles may be more than two, and appear to arise not as branches from the primary fertile branch, but independently. In such cases the subbasal cell of the primary receptacle evidently undergoes secondary divisions, and each of the resultant cells sends down its fertile branch to form a corresponding number of secondary receptacles. I have found it almost impossible to determine this connection by actual observation, but that the secondary receptacles are multiplied in this fashion seems evident from the appearance of detached primary receptacles such as are represented in fig. 10, Plate XL, or fig. 12, Plate XLI.

That still another type exists is indicated by the conditions seen in *H. Paranensis* and *H. Nyctoboræ*. Although both these species are closely allied to *H. tricuspidatus*, their secondary receptacles are not continuous cell-series, as in this species (Plate XL, fig. 11), but each perithecium is associated with a shield-like receptacle (Plate XXXIX, fig. 5 and Plate XL, fig. 3). These shield-like structures appear to be quite independent of one another, but that they do not arise, as in the type last described, from distinct branches representing outgrowths from a corresponding cell formed by secondary divisions of the subbasal cell of the primary receptacle, is evident from the conditions seen in isolated primary receptacles (Plate XL, fig. 5) from which but a single branch has been developed in the usual fashion. Whether these shield-like structures arise as branchlets from the primary branch, or whether they are to be considered intercalary modifications of it, I have as yet been unable to determine. The former alternative, however, appears to be the more probable.

A curious condition is also illustrated by *H. Periplanetæ*, which is the most easily obtained and commonest member of the genus. In the typical form of this species a remarkable shield- or shell-like structure is developed, that completely covers the secondary receptacles of the female individuals, which are seated on the integument of the host (Plate XLI, figs. 6–7). This shield-like structure is evidently an upgrowth from one of the secondary receptacles that compose the group, and is a very characteristic and highly specialized structure. When, however, this species develops wholly on the bristle, and the primary fertile branch is unable, or barely able, to reach its base, a curious variety of conditions may result; the most striking difference being indicated by such a form as is illustrated in fig. 8, Plate XLI, in which the whole habit of growth of the secondary receptacle is changed, becoming identical with that of types like *H. chætophilus* (fig. 14). A form which has barely reached the base of the bristle is represented in fig. 10, and in this instance a rudimentary shield has been formed, while in fig. 9, one more fully, though somewhat abnormally developed, is present. Enough transitional conditions have been examined to make it evident that figs. 7 and 8 represent individuals of the same species. The existence of such remarkable variations in a single species indicates that it is necessary to use considerable caution in determining the limitations of species in this genus.

The male individuals vary greatly in their development; some, like *H. chætophilus*, producing only one or two antheridia directly from the typical four-celled primary receptacle; while others may show much greater complication; the most highly developed type being illustrated by *H. Ectobiæ*, the secondary male receptacles of which may produce several hundred antheridia. The latter, in all species are similar to others of the simple type, usually elongate and often showing no very marked distinction between the neck and venter. In a single specimen of *H. Paranensis* the development of antheridia from a single receptacle has been observed; an abnormal condition which finds a parallel among hermaphrodite forms, in which antheridia occasionally replace perithecia, as has been already illustrated in my former Monograph.

The generic type of *Herpomyces* appears to be very well defined, and although in *H. Ectobiæ* the presence of creeping secondary receptacles in the male, as well as in the female, tends to set this form apart from the others, it should be remarked that the same condition occurs in *H. Anaplectæ*. Such male receptacles in this species are, however, rudimentary, and the antheridia are generally produced from the primary receptacle. The immediate affinities of the genus are not apparent, and there appears to be no obvious connection between it and the other diœcious genera with simple antheridia (*Amorphomyces* and *Dioicomyces*). Although the habit of producing fertile branches which grow horizontally from the primary receptacle is found in other diœcious genera like *Dimorphomyces*, there is no other instance in the whole group in which nutrition is effected by means of secondary attachments to the host. It is not difficult, however, to imagine how a form like *Dimorphomyces Thleoporæ*, for example, might originate a somewhat similar condition through the production from its fertile branch of rhizoidal attachments; since it already lies in contact with the surface of the host. Among the known diœcious forms, however, which are characterized by simple antheridia and with which the members of the present genus would be naturally supposed to be more closely associated than with any of the other genera, one finds no tendency toward the formation of such fertile branches, and their other characters vary widely from those of *Herpomyces*. The structure of the perithecium and the relatively greater complication in the general structure of both sexes might be assumed to place it higher in the scale than either *Amorphomyces* or *Dioicomyces*, although the occurrence of a series of forms on Blattidæ, which are supposed to be representatives of one of the most ancient types of true insects, might perhaps have been expected to be correlated with a more primitive type in the parasite. But although the unisexual forms with simple antheridia might for some reasons be assumed to be the more primitive, the present genus is distinguished by a far more complicated structure than the other unisexual forms of the same type, and *Amorphomyces* still remains, as has been pointed out above, by far the simplest in structure of all the Laboulbeniales.

Although I have as yet been unable definitely to determine this point, the number of spores in an ascus appears to be eight, and if this is the case, it is a character shared only by *Moschomyces* and *Compsomyces*. It may be of interest to note that these genera present a further resemblance in possessing more than usually numerous wall-cells in their perithecia. In one other respect the present genus is unique, namely in the possession of a peculiar blackish foot-like process near or beside the terminal spinous process which is often conspicuous at the tip of the primary receptacle (Plate XLI, figs. 10, 14, 18). The significance of this appendage I am unable to suggest. Although very characteristic, it may sometimes be absent.

The Blattidæ, which are the only hosts of *Herpomyces*, are common in buildings, especially on water fronts and abound especially in tropical regions. Many species occur under logs and under bark and are often numerous in rubbish or under stones. The Croton Bug and the Cockroaches are familiar household pests throughout the world, and all serve as hosts for members of this interesting genus.

HERPOMYCES CHÆTOPHILUS Thaxter. Plate XLI, figs. 14–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 12. June, 1902.

Male individual consisting of four superposed cells, hyaline, the distal cell terminated by a blackish projection similar to the small foot. The three distal cells, sometimes only the terminal one, usually producing slight outgrowths which bear the single, nearly erect, long, slender antheridia directly; or may separate a cell which bears one or very rarely two such antheridia; the latter nearly as long as the four-celled individual. Total length to tips of antheridia 50–55 μ.

Female individual. Primary individual similar to the male, but stouter; terminated by a similar blackish projection. The fertile branch arising laterally from the subbasal cell, growing down in the form of a slender filament variable in length, usually of two or three cells, enlarging abruptly to form the single secondary receptacle. Secondary receptacle pale dirty brownish yellow, consisting of a vertical series of cells partly double above, simple below; the cells thick-walled, the long (transverse) axes directed obliquely upward and outward, about five to fifteen in number, their points of contact with the host surrounded by a slightly blackened irregular foot-like haustorial margin, and giving rise to single simple, or very rarely branched, haustoria which penetrate the wall of the spine at right angles to its surface; the cells all sterile with the exception of the proximal one from which arises the solitary, nearly erect perithecium. Perithecium relatively large, rather stout; the ascigerous portion large, slightly inflated, longer than the outwardly curved distal portion, which tapers to the bluntly pointed unmodified apex; the tip bent abruptly outward. Spores 30–35 × 3 μ. Perithecia 125–185 × 35–48 μ. Total length of primary individual 35–40 μ. Secondary receptacle 35–75 × 22 μ.

On spines of legs, antennæ and anal appendages of *Periplaneta* sp., Zanzibar, Africa; Mus. Comp. Zoöl. On *Periplaneta* sp., Mauritius; Mus. Comp. Zoöl., No. 1357.

This species, which is taken as the type of the genus, appears to be perhaps its simplest form, and is distinguished by its solitary perithecium, the tip of which is unarmed and bent outward, as well as by its vertically developed secondary receptacle. It has not been observed on any other of the many individuals examined of its supposedly cosmopolitan host. Its general habit is closely approached by chætophilous forms of *H. Periplanetæ* (fig. 8), but the perithecia are quite different in the two species.

HERPOMYCES PERIPLANETÆ Thaxter. Plate XLI, figs. 6–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 13. June, 1902.

Very variable according to the host and the position of growth.

Male individual consisting of four superposed cells, the two upper, in simpler individuals, producing one or two antheridia which are either sessile or borne on a single stalk-cell: in more highly developed individuals the two distal cells producing short branches which may bear several antheridia directly, or on secondary branchlets, some of which appear to be occasionally sterile; the total number of antheridia sometimes six or more. Greatest length of well-developed forms, to tips of antheridia, 90 μ, of small specimens 60 μ.

Female individual, hyaline or nearly so. Primary receptacle surmounted by two or more sterile cells, the uppermost often asymmetrical, ending in a terminal spinous process and bearing the minute characteristic black projection laterally: the subbasal cell sometimes several times divided, each resultant cell apparently giving rise to a single branch from which is developed the very variable secondary receptacle. Secondary receptacle: *in simple individuals growing on spines of host;* consisting of a vertical series of from four to twenty or more obliquely superposed cells, alternating to form a double row, otherwise similar to that of *H. chætophilus* and like it producing a single erect perithecium from one of its uppermost cells:

in individuals growing on the integument of host; producing a variable number of fertile branches, disposed subhorizontally on either side of the primary receptacle, the peritheeigerous cells, of which there may be from one to six, together with the male individual when present, and the bases of the perithecia, protected by a shield- or shell-like, usually very unequally bilobed cellular upgrowth, rounded or bluntly pointed above, the symmetrically curved successive cells which compose it enormously elongated transversely, their lumen scarcely wider than the intervening walls and forming a series of concentrically arranged arcs, the concavities directed downward. Perithecia one to six, commonly five in well-developed specimens, slightly divergent from the median line, long, pointed, tapering from the slightly, more or less asymmetrically inflated base; the distal portion not clearly differentiated, tapering more or less, curved, the slender upper portion bent abruptly inward toward the tip; the pointed apex bent inward, subtended externally by a terminal, slightly incurved, rather slender, bluntly pointed unicellular process, the cells of the cell row which it terminates distinctly larger than the other wall-cells; basal cells somewhat prominent. Spores 16 × 1.5 μ. Perithecia 145–220 × 30–36 μ, the process 14 μ. Secondary receptacle, including protective shield, in well-developed individuals 125 × 75 μ; in small specimens 35 × 50 μ; when vertically developed without shield 35–110 × 18 μ.

On *Periplaneta Americana* Sauss. (type form), Cambridge (Mr. Bullard): Bermuda, Mus. Comp. Zoöl. On *Periplaneta Australasiæ* Sauss., Bermuda. On *Periplaneta* spp., Mexico, West Indies, Panama, Brazil, Africa, South Seas, China. All Mus. Comp. Zoöl. On *Stylopyga orientalis* Scudd., Boston, Mus. Comp. Zoöl.

This common, and in its typical condition, very striking form, appears to be as universally distributed as are its cosmopolitan hosts. It is remarkable for its variability on different hosts or in different positions on the same host. Thus the shell-like shield of the typical form is very frequently absent in specimens on *Stylopyga*, the form represented in fig. 8, being that which occurs most commonly on this host, while on *Periplaneta* it is rarely seen. On *Stylopyga*, moreover, the shield-like covering, when it is developed at all, is usually much smaller than in individuals growing on *Periplaneta*, and the number of perithecia is usually less. In individuals of the type represented in fig. 8, one often finds instances in which two secondary receptacles have developed from the primary one, each producing its solitary perithecium, the two seeming to be paired.

In the normal typical form (fig. 7) the cells beneath the shield are so closely compacted that I have not been able to satisfy myself as to the exact relations of the structures developed from the female primary receptacle. As in other cases, however, the subbasal cell of the latter seems to cut off a number of cells distally, each of which produces a fertile branch (fig. 12); there being usually five such branches, as shown in the figure; the lower cell, at the left in this figure, being the basal cell of the receptacle from which the foot is broken. If each of these branches produced its single perithecium one would have the condition seen in fig. 7, which is that usually found, the individual bearing five perithecia; one, supposedly, from each branch. Where less than five occur, as often happens, it may be assumed that a smaller number of branches have been developed from the subbasal cell.

A comparison of figs. 10, 9 and 7 will show how the typically bilobed shield is produced by growth of one of the secondary receptacles upward and outward, on both sides, but much more so on the right than on the left. The form of the perithecium in this species and the position and character of its terminal spine, distinguish it from all others, even in cases (fig. 8) where the normal shield has not been developed. The hosts are the common brown and black roaches and the fungus is usually conspicuous from its white color, growing in tufts, especially on the antennæ.

Herpomyces Platyzosteriæ Thaxter. Plate XXXIX, figs. 3–4.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 310. July, 1905.

Male individual consisting of four superposed cells bearing distally one or several antheridia. Total length to tip of antheridia about 40 μ.

Female individual, colorless. Primary receptacle consisting of four superposed cells, the terminal one acuminate; the subbasal giving rise to a branch which produces a single secondary receptacle, made up of a vertical series of cells, obliquely superposed, and variable in number, giving rise above to a solitary perithecium. Perithecium erect, bent inward toward the seta on which the individual grows, the ascigerous portion hardly, or not at all, inflated; the distal portion curved outward, tapering to the pointed apex, which is subtended on the inner side by a stout, bluntly rounded projection, about as long as the free apex of the perithecium, which extends outward at right angles from its base. Total length to tip of subterminal projection 160–225 μ. Perithecium 150 × 33 μ, its terminal process 10 × 3.5 μ.

On the antennal setæ of *Platyzosteria ingens* Scud., Mexico; Scudder Collection, No. 1384.

In the conformation of its perithecial tip this species resembles *H. Zanzibarinus* more nearly than any other species. The perithecial appendage or subterminal process is, however, blunt or even slightly enlarged distally. The host is a large wingless roach, species of which are very common in Florida: but although, through the kindness of Professor Rolfs, I have had an opportunity to look over numerous specimens from Miami, I have been unable to discover any parasites on them.

Herpomyces Zanzibarinus Thaxter. Plate XL, figs. 8–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 15. June, 1902.

Male individual consisting of four cells, the distal one furnished with a sharp colorless terminal spine and a small blackish subterminal process, both of which become pushed to one side by the development of one, or sometimes two, sessile antheridia; the subterminal cell somewhat larger, sterile, or producing an antheridium laterally. Total length 28 × 6.5 μ. Antheridia 25 μ.

Female individual colorless. Primary receptacle surmounted by two sterile cells, the upper terminated by a sharp spinous process subtended by a blackish process, as in the male: the subbasal cell apparently divided at least once, the two, or more, cells producing a fertile branch from which two few-celled, paired, compact secondary receptacles are produced, secondary fertile branches sometimes arising from division, of the subbasal cell; each of which bears a single perithecium, the cells rather irregular, about five or six in number, subhorizontal in position, without characteristic modification. Ascigerous portion of the perithecium relatively stout, inflated on its inner side, almost twice as long as the distal portion, which tapers from it rather abruptly: distal portion curved inward abruptly at the pointed tip, which diverges from an erect blunt unicellular process which subtends it, at an angle of more than 90°. Perithecium, including base, to tip of terminal process, 125 × 28–32 μ; the process 10 μ long. The pair of fertile receptacles together about 30–35 × 45 μ broad (horizontally).

On the antenna of a large black wingless roach, Zanzibar, Africa; Mus. Comp. Zoöl., No. 1354.

This species is most nearly allied to *H. Platyzosteriæ* from which it differs in its smaller size, paired habit, and in other structural details.

Herpomyces arietinus Thaxter. Plate XL, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 14. June, 1902.

Male individual consisting of four superposed cells, the basal one relatively long, the distal ones bearing two to three antheridia. Length about 29 μ. Antheridia about 20 μ.

Female individual hyaline. Primary receptacle surmounted by two sterile cells, the upper terminated by an erect distally mucronate appendage; the subbasal cell, and often one or two cells which may be separated from it above, giving rise each to a branch which becomes immediately furcate; each branchlet producing a secondary receptacle. Secondary receptacles, symmetrically paired or several, each consisting of a horizontal series of about twelve or more vertically elongated, subfusiform, more or less curved cells, corresponding to and external to the fertile cell which bears the primary perithecium, the external margin free. Ascigerous portion of the perithecium relatively long, hardly inflated, tapering slightly above, where it passes into the distal portion; which is about half as long, tapers slightly, and is terminated by an incurved, tongue-like, slender, subcylindrical prolongation of the apex on the inner side, and by a relatively long straight erect slightly tapering subtending terminal unicellular spine-like process. Spores about 20 × 2 μ. Perithecia 100 × 22 μ, the terminal process 18 μ. Secondary receptacles, together, 55 × 18 μ.

On the antenna of a small brown wingless roach (probably *Temnopteryx* sp.) taken under stones and bark near the mouth of the Mammoth Cave, Kentucky; Mus. Comp. Zoöl., No. 1370 Type. On *Temnopteryx* sp., Prouts Neck, Mass., No. 1380, and Georgia, No. 1382, Scudder Collection. On *Ischnoptera* sp., Georgia, No. 1386, Scudder Collection.

This species is easily distinguished by the relatively large and long terminal spine, and the elongate nearly cylindrical slender tip of the perithecium. The secondary receptacles are usually paired, but several may develop, generally behind the first two, and appear to arise from secondary fertile branches from the receptacle. The secondary receptacles are sometimes more closely cellular and somewhat larger relatively, than is shown in fig. 7; but the species appears to be otherwise quite constant on all the hosts mentioned.

Herpomyces Diplopteræ Thaxter. Plate XLI, figs. 1–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 16. June, 1902.

Male individual; four-celled, the two middle cells roundish-oblong, the distal longer and subcylindrical, terminated by the usual minute blackish projection; the subterminal and subbasal cells each producing one or two nearly sessile, or short-stalked, antheridia, with well differentiated slender necks. Total length to tips of antheridia about 50 μ.

Female individual. Primary receptacle similar to male, the subterminal and subbasal cells subcylindrical, longer than broad; the fertile branch producing two symmetrically placed secondary receptacles, the sterile external cells yellowish, somewhat larger and more distinct, about twelve or more in number; the series extending externally and inferiorly to form a free buttress-like margin, which almost wholly covers the single fertile cell. Perithecium yellowish, straight, nearly erect, the base bulging very slightly; but hardly broader than the ascigerous part, which is relatively large, long, subcylindrical, or slightly inflated; the distal part, relatively short, rather abruptly distinguished; the posterior cell-row, which is external in relation to the host, more prominent, with larger thick-walled cells, the fifth from below prolonged to form a long, bluntly tipped, erect, horn-like, subterminal projection, distally curved inward above the short slightly incurved pointed subconical tip. Total length of perithecium (exclusive of base) to tip of process 150 μ; to tip 115 μ: ascigerous part 70–75 × 28–30 μ, distal part to tip 35–40 μ; the process, free part, 25–30 μ, whole cell 40–44 μ. Secondary receptacles both together 55–65 × 25 μ. Total length to tip of process 175–185 μ.

On antennæ of *Diploptera dityscoides* Serv., Ascension Island, South Atlantic; Mus. Comp. Zoöl., No. 1371.

The secondary receptacles are paired in all the individuals of this species which have been examined, and are relatively small; the body of the perithecium is nearly isodiametric till it narrows suddenly to the relatively short, abruptly distinguished distal portion, which is terminated by the relatively long curved spine; the tip short and subconical. It is otherwise very similar to *H. arietinus*.

Herpomyces Phyllodromiæ Thaxter. Plate XXXIX, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 310. July, 1905.

Male individual consisting of four superposed cells: producing distally one or several antheridia directly. Total length about 30 μ.

Female individual. Colorless, the primary receptacle minute, consisting of four subequal cells: the subbasal sending down a branch which furcates to produce a pair of small secondary receptacles, consisting of only two or three vertically elongated cells and each bearing a solitary perithecium. Perithecia more or less symmetrically placed, the ascigerous portion slightly inflated, tapering above to the somewhat slender distal portion, which bends abruptly outward from the substratum, diverging but slightly; the tip subtended by a blunt pointed spine-like projection, directed nearly at right angles to the axis of the free tip. Primary receptacle about 25 μ long. Secondary receptacle 20 × 10 μ. Perithecium, to tip of process, about 80–100 × 15–20 μ.

On antennæ of *Phyllodromia* sp., Abyssinia; Scudder Collection, No. 1381.

This is a small and rather insignificant species of which the material is not very abundant. Though resembling *H. Anaplectæ* in some respects, and like it in possessing a very small secondary receptacle, the spinose tip of the latter and the very simple male individuals recall the conditions seen in *H. Zanzibarinus*. It is unlike other species owing to the slight divergence of the paired perithecia and their strong tendency to bend outward from the substratum. An examination of more abundant material may show that the male individual is not in all cases so simple as in the individual represented in fig. 2.

Herpomyces Ectobiæ Thaxter. Plate XXXIX, figs. 11–16.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 20. June, 1902.

Male individual consisting of four superposed cells terminated by the characteristic blackish projection, the distal cells producing a dense appressed tuft of coherent antheridial branchlets and antheridia; the subbasal cell usually giving rise to a fertile branch, simple or furcate, which produces secondary male receptacles consisting of irregularly double straggling series of cells, some of which are sterile, while others bear short-stalked, unilateral, dense antheridial tufts similar to the primary one (which may sometimes be lacking?).

Female individual colorless. Primary receptacle as in the male, terminated by two short cells, the upper of which bears distally the characteristic blackish minute foot-like projection, the subbasal cell producing a simple or furcate fertile branch. The fertile receptacles, like those of the male, often creeping extensively, consisting of an irregularly double series of obliquely seriate cells, sterile or fertile without definite sequence, the whole plant producing sometimes twelve or even more perithecia, developed as a rule in irregularly acropetal succession. Perithecia subsessile, inflated below, attenuated above, the extremity bent or sometimes slightly recurved, the apex unmodified. Spores 20 × 2.5 μ. Perithecia, including base, 80–90 × 20 μ. Total length of secondary receptacle, longer, 200–225 × 15 μ. Primary individual 22 μ.

On *Ectobia Germanica* Scudd., Cambridge, Mr. Bullard. On *Ectobia* sp., Zanzibar; Mus. Comp. Zoöl., No. 1357: St. Kitts, West Indies; Mus. Comp. Zool., No. 1361.

Since repent males and females usually grow together, the antheridia and perithecia often appear to arise from one plant, but this is never the actual condition. The species can hardly be confused with any other, unless perhaps with *H. Anaplectæ*, to which it is most nearly allied; but from which it may be distinguished by the repent habit in both sexes, and by the shape of the perithecia. The species is doubtless as widely distributed as is its cosmopolitan host, the common "water bug" or "Croton bug" well known to housewives.

Herpomyces Anaplectæ Thaxter. Plate XXXIX, figs. 9–10.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 309. July, 1905.

Male individual consisting of four superposed cells, the two or three upper ones becoming variably branched, and bearing a variable number of antheridia on the branchlets; the subbasal cell apparently in some cases producing one or two small secondary receptacles, each of which bears an irregular tuft of antheridia. Total length, including antheridia, 35–50 μ. Antheridia 24 × 2 μ.

Female individual hyaline. Primary receptacle mostly 4-celled, the distal cell at first long, conical, mucronate, becoming more or less collapsed and irregular at maturity; the subbasal giving rise to a branch from which are formed a pair of small secondary receptacles, each producing a single perithecium; the two symmetrically placed, and symmetrically curved away from the axis of the primary receptacle. Perithecium long, slender, tapering from below the middle to its attenuated apex; the transverse boundaries of the wall-cells often indicated in the middle region by more or less distinct elevations, the apex unmodified, blunt. Primary receptacle 25 × 3 μ. Secondary receptacle 16 × 13 μ. Perithecium 80–90 × 16 μ. Spores about 18 × 2 μ.

On the antennæ of a species of *Anaplecta* allied to *A. Dohrinana*, collected under stones along the margin of a stream near Caracas, Venezuela, by Dr. A. F. Blakeslee.

This species is most nearly allied to *H. Ectobiæ* and occurs on a related host. The male individual sometimes produces a short branch from the subbasal cell which gives rise to a small secondary receptacle (or perhaps in some individuals to two, through furcation), bearing small tufts of antheridial branches. In the female the perithecia are very regularly and symmetrically paired as shown in fig. 9, the secondary receptacles, in marked contrast to those of *H. Ectobiæ*, being less well developed than in any other species.

HERPOMYCES FORFICULARIS Thaxter. Plate XL, figs. 18–22.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 15. June, 1902.

Male individual minute, consisting of four superposed cells, the three upper subequal, nearly round, constricted at the septa, the distal one terminated by a short bluntly pointed appendage resembling a minute foot, which is commonly turned to one side by the development laterally from the same cell of a single slender antheridium. Total length 18 × 5 μ. The antheridium about 35 μ.

Female individual. Primary receptacle consisting of two superposed cells terminated by a single abruptly smaller sterile cell, which is slightly longer than broad and is terminated by a bluntly pointed appendage similar to that of the male, but larger; the subbasal cell much enlarged, somewhat inflated, the fertile branch at once furcate so that two secondary receptacles are formed symmetrically placed on either side of and just below the primary receptacle. Secondary receptacles distinctly yellowish externally, consisting of a nearly horizontal series of about ten sterile cells, very narrow from the great elongation of their transverse axes which are vertical in position, and so arranged as to cover more or less completely the single fertile cell, which is subtriangular and gives rise to a solitary perithecium. Base of the perithecium nearly as broad as the secondary receptacle, forming a short stout neck: perithecium relatively large, the ascigerous portion somewhat longer than the distal part, very slightly inflated, nearly isodiametric, the base of the trichogyne persistent as a rather conspicuous hyaline projection between it and the distal part which is but slightly narrower, hardly tapering, the large lateral cells thick-walled, the rows similar on either side and terminating in large incurved tapering bluntly pointed brownish-yellow unicellular projections, which surmount the perithecium like a pair of mandibles, the inner somewhat shorter and straighter: the short, pointed apex included between their bases and bent slightly inward. Spores about 18 × 2 μ. Perithecia including base 200 × 36 μ; the terminal projections, longer, 35 μ. Secondary receptacles 35 × 20–35 μ. Primary receptacle including sterile terminal cell 20 × 7 μ. Total length to tip of perithecium 220–250 μ.

On antennæ of a wingless roach, Mauritius (?); Mus. Comp. Zoöl., No. 1353.

This curious form is readily distinguished by its perithecium which is relatively long and broad and is terminated by two incurved subequal caliper-like processes on either side of the tip, thus presenting an appearance seen in no other species. It is most nearly allied to *H. tricuspidatus*, *H. Paranensis* and *H. Nyctoboræ*, but lacks the third spinous process seen in these species, and is otherwise widely different. In all the specimens examined the secondary receptacles are regularly paired as in fig. 18.

HERPOMYCES TRICUSPIDATUS Thaxter. Plate XL, figs. 11–17.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 17. June, 1902.

Male individual variably developed, the terminal cell rounded, apiculate, but as a rule soon indistinguishable through proliferation of the cells below, the simple forms producing few antheridia, although in most instances, through continued successive proliferation, a dense compact more or less appressed tuft is formed. Antheridium long flask-shaped, hardly distinguished from the usually several-celled branchlet which it terminates. Total length to tips of antheridia 75 μ.

Female individual. Primary receptacle small, surmounted by two rounded cells constricted at the septa, the distal one bearing a small sharp spine subtended by the usual minute blackish projection: the subbasal cell producing apparently a single fertile branch which divides at once, growing in opposite directions to form the somewhat irregular, and variably developed continuous secondary receptacles, which may creep more or less extensively; the component cells, which are often very numerous, being vertically elongated and becoming arranged in two more or less complete rows; the inner mostly fertile, producing perithecia of which there may be twelve or rarely more; the outer becoming several times closely divided vertically, the cell-group which thus gives rise to the perithecial stalk, laterally connected with corresponding adjacent cell-groups throughout its lower third only, the upper two thirds forming a free, or nearly free, continuation of the perithecial stalk, forming no free protective margin above, while below they develop a continuous, irregularly lobed, spreading haustorial margin in close contact with the host. Perithecia raised on a well-developed stalk, consisting of two unequal and asymmetrical cells placed side by side; that on the side toward which the tip of the perithecium is bent (anterior) attenuated below and extending higher than the posterior, which becomes narrower upward from its broad base; the stalk becoming gradually and slightly broader from below upward, and directly continued by the base of the perithecium from which it is not distinguished. Ascigerous portion of the perithecium distinguished from the base by a very slight prominence, and about as long as the stalk and base combined; becoming distally slightly broader, the two lower tiers of wall-cells separated by a slight elevation; the third wall-cell of the anterior row small, and forming a prominent elevation followed by a depression which subtends a large, erect, tapering, bluntly pointed, distally incurved spinous process, formed by an outgrowth of the lowest cell in the anterior row of wall-cells of the distal portion (fourth anterior wall-cell), which extends upward higher than the tip of the perithecium, its upper two thirds forming a free spine; the lower cell of one of the corresponding lateral rows (fourth lateral wall-cells) producing a similar process, shorter, slightly sharper, curved inward distally toward the apical pore, this process always external in relation to the host and thus developed on the right or left side according as the perithecium is formed from the receptacle at the left or at the right of the original insertion toward which the anterior sides of all the perithecia are turned: the rest of the terminal portion above the bases of these outgrowths short, abruptly tapering, its outer margin vertical, slightly prominent and not distinguished from the posterior margin of the ascigerous portion, which is directly continued by it; its inner margin running abruptly inward and upward from the base of the anterior process to the small blunt tip, which is curved abruptly inward and is subtended by a nearly erect, short, sharp spinous process; the whole nearly symmetrical with the anterior process which is very slightly longer. Spores about 12 μ long. Perithecia, ascigerous portion 45–50 × 25 μ, terminal part to tip 28 μ, anterior process 30–34 μ, apical process 8 μ, stalk, including basal cells, 45–58 × 16–18 μ. Total horizontal extent of larger individuals including both receptacles 220 μ. Fertile cells below perithecial stalks 30–40 × 13–15 μ. Total height to tip of perithecial process 175–200 μ.

On *Blabera* sp. and *Epilampra* (?) sp., Panama; Mus. Comp. Zoöl., No. 1364. On *Epilampra* sp., No. 1360, St. Kitts, W. I. (type), No. 1366, Hayti. On a wingless form labelled "China?" All Mus. Comp. Zoöl., and in all cases on the antennæ.

Although the perithecia of this species resemble very closely those of *H. Nyctoboræ* in the disposition of their spinous processes, the general form of the perithecium is quite different. The latter are further borne on long stalk-cells which occur neither in *H. Nyctoboræ* nor in the nearly allied *H. Paranensis.* It differs also from all of the other bi- or tri-cuspidate forms in the structure and mode of growth of its secondary receptacles. The perithecia appear to mature more or less simultaneously; at least I have seen no instances in which young and mature perithecia were associated on the same individual. The male individuals vary considerably in their development, some producing perhaps a dozen antheridia, or less, while in others a dense tuft is present containing many times this number.

HERPOMYCES NYCTOBORÆ Thaxter. Plate XXXIX, figs. 5–8.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 309. July, 1905.

Male individual. Axis consisting of five or six cells, the basal somewhat elongate, the rest short and somewhat rounded, the terminal one abruptly apiculate; the distal cells producing branches which in turn branch three to four times, the ultimate branchlets bearing the antheridia terminally in groups, the whole forming a dense tuft. Axis about 54 × 10 μ, the total length to the tips of the antheridia about 100 μ. Antheridia 20 × 3 μ.

Female individual. Colorless, the primary receptacle consisting of four or five cells, the terminal one short and apiculate; the subbasal (perhaps others also?) giving rise to branches which produce a variable number of secondary receptacles arranged with the younger behind the older, as in *H. Paranensis*. The secondary receptacles much as in *H. Paranensis*, the first formed broadest. Perithecium long and slender, tapering, especially above the middle; the stalk-cells flattened, so that the perithecium is almost sessile on the receptacle; the ascigerous portion often abruptly somewhat narrower than the base, the fourth lateral external wall-cell bearing a long curved attenuated wholly free spine-like cell, which extends just beyond a subterminal short distally incurved sharp spinous process, which subtends, and is nearly twice as long as, the free curved tip of the perithecium: the fourth anterior wall-cell also producing a long curved spinous process, slightly shorter than the lateral one, or more divergent. Secondary receptacles 65 × 45–50 μ. Base and stalk-cells of perithecium 30–35 × 15–18 μ, the ascigerous part to tip of longest spine 150–165 μ: width near base 20–25 μ, below lower spine 10–12 μ; external spine 50 μ, terminal spine 12 μ.

On antennæ of *Nyctobora latipennis*, Texas; Scudder Collection, No. 1383.

This species is closely allied to *H. Paranensis*, from which it differs in its more highly developed male individuals, and in the form and structure of its perithecium. The slender tapering habit, and the arrangement of the spines in relation to the tip, being quite different; although the form and arrangement of the secondary receptacles are very similar.

HERPOMYCES PARANENSIS Thaxter. Plate XL, figs. 1–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 19. June, 1902.

Male individual. Terminal cell distally modified to form a long slender flexuous tapering unicellular prolongation extending above the tips of the antheridia which are few in number, terminal on rather long often several-celled branchlets. Total length to tip of terminal prolongation 250 μ; the prolongation 185 μ. Antheridia about 60–70 μ.

Female individual. Primary receptacle very small, the distal cells rounded, the uppermost prolonged as in the male. First secondary receptacles developed on either side of the primary, those formed later lying behind them on either side so that the perithecia are more or less clustered (younger ones appearing behind the two primary ones), and each secondary receptacle developing a shield-like structure external to the base of the first fertile cell, like a buttress, the outer and upper margins of which are free, consisting of sterile cells which are greatly elongated vertically and very narrow, similar and successively fewer-celled buttresses being formed behind the primary one in connection with each of the remaining perithecia, of which there may be from four to six or more. Perithecia very similar to those of *H. 3-cuspidatus*, but with the following differences: the greatly elongated fertile cell of the receptacle extends nearly to the base of the perithecium, the posterior stalk-cell extending downward beside it nearly to its base, covered by the protective shield except at its distal end, which is connected by a narrow isthmus with an abrupt short broad terminal enlargement; the anterior stalk-cell small, short, subtriangular in outline; the base of the perithecium abruptly somewhat broader, its cells protruding more or less distinctly; the ascigerous region thus somewhat clearly distinguished, especially posteriorly, relatively distinctly larger than in *H. tricuspidatus* somewhat inflated; the conformation of the distal portion similar in general, but the third wall-cell of the anterior row is not modified to form a prominence at the base of the anterior spiniferous cell, the upper half of which forms a free spinous process slightly incurved distally and equalled or even exceeded by the lateral spinous process: the free tip of the perithecium about twice as long relatively, slightly incurved, the erect incurved spinous process, which subtends it externally, more than twice as long as that of *H. 3-cuspidatus* and sublateral; the tip between the base of this spine and the inner angle of the anterior spine relatively shorter and broader. Spores about 15 × 1.6 μ. Perithecium: ascigerous portion 58 × 30 μ; terminal portion to tip, 40 μ; anterior process, free portion, 22–25 μ, whole cell, 50–54 μ; subterminal process, free part, 17 μ; total length, 123 μ, including basal cells. Width of two outer buttresses together 85–100 μ; height of shield-like upgrowth 36–50 μ; length from insertion to base of perithecium 60–80 μ; total length from insertion to tip of perithecial spine 180–218 μ.

On antenna of a wingless roach *Blabera* sp., Para, Brazil; Mus. Comp. Zoöl., No. 1362; on *Blabera* sp., Mexico, Scudder Collection.

As has been previously mentioned, the primary receptacle of this species appears to give rise to one branch only (fig. 5), and is very small and otherwise peculiar, the terminal cell greatly elongated and tapering. The fertile branch becomes furcate at once, and the groups of buttressed perithecia seem to result from continued secondary branching; the first pair of secondary receptacles that is produced being anterior and more highly developed, shielding the later ones which arise behind them. The development of the perithecia in these secondary receptacles does not appear to be so simultaneous as it is in other species, *H. Periplanetæ* for example; since very young perithecia are often associated in the same individual with others that are fully matured.

The present form is most nearly allied to *H. Diplopteræ* which is characterized by the same mode of growth, but possesses very different perithecia, and also to *H. tricuspidatus* in which the habit of growth is quite unlike either of these species.

AMORPHOMYCES Thaxter. Part I p. 295.

The single described species of this genus still remains the simplest of all the types thus far discovered and unique in possessing spores which are continuous. Whether this simplicity should be considered indicative of a primitive condition or as due to a process of reduction, it is quite impossible to say. The species has been seen from various localities in New England where it is common and has also been received from Ohio. Certain undescribed forms are also known from South America, which adhere strictly to the type of *A. Falagriæ*.

DIOICOMYCES Thaxter. XLII 16-36

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 33. June, 1901.

Male individual consisting of four superposed cells, the upper of which is a simple antheridium bearing a subterminal discharge tube.

Female individual. Receptacle ending in a peculiarly modified sterile prominence, corresponding to the upper spore-segment: the subbasal cell producing a single perithecium laterally, and separated from the sterile terminal cell by a second small cell. Perithecium free, stalked; the ascogenic cell single, the spores more or less obliquely once-septate, and of two kinds corresponding to the sexes.

This genus is distinguished from *Amorphomyces,* to which it is closely allied, by its obliquely septate spores; as well as by the fact that its perithecium, instead of being terminal, arises laterally below two sterile cells which terminate the receptacle. The subterminal origin of the discharge tube of the antheridium is a further and apparently constant difference; while the presence in the male individual of four, in place of three, cells, serves to separate the two genera at once. The difference in size between the male and female spores is usually very striking, Plate XLII, figs. 24, 25 and 29, and as in the other diœcious genera, one almost invariably finds that the two have been discharged simultaneously and have developed side by side. When the discharge of spores has been copious, however, and the individuals are growing in a more or less crowded condition, this pairing of the sexes may not be so clearly marked, but it is noticeable that female spores which have begun to develop in positions where there are no male individuals in close proximity tend to abort.

The trichogynes of this genus which have been examined are of the simple type illustrated in fig. 23, and consist of two cells that form a thick-walled inflated structure, from the distal end of which the small thin-walled receptive papilla is developed in close proximity to the end of the discharge tube of the male individual, a condition almost exactly similar to that found in *Enarthromyces*. Abnormal males rarely occur in which a second antheridium may be formed below the first, but such conditions are exceptional. The male individuals in the different species are all very similar and with the exception of *D. Floridanus*, which is unusually large and possesses a very long discharge tube, can hardly be distinguished from one another. The species, which are probably more numerous than might be supposed from the small number of described forms, have thus far been found only on Staphylinidæ and on Anthicidæ, small beetles inhabiting vegetable refuse of various sorts, and sometimes swept from flowers.

DIOICOMYCES ANTHICI Thaxter. Plate XLII, figs. 18–25.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 33. June, 1901.

Male individual. Form slender, of nearly the same diameter throughout, the basal cell half the total length of the individual to the tip of the discharge-tube; the third cell nearly square, the subbasal about as large as the terminal antheridial cell, which ends in a distal blunt projection; the discharge-tube arising laterally below the tip, projecting upward from a broadened base, slightly divergent from the main axis, slender, about as long, or a little longer than, the body of the antheridial cell. Length to tip of antheridial cell, including foot, 50 μ: to tip of discharge-tube 60 μ. Width 8 μ.

Female individual. Often more or less strongly curved, the terminal sterile cell bluntly pointed, slightly curved, brownish; the basal cell becoming narrower below, the upper septum convex; tinged with brown posteriorly as is the rest of the receptacle: the subbasal cell very small, subtriangular; separated from the terminal sterile cell by a somewhat smaller triangular cell. Stalk-cell of the perithecium hyaline, long, often about the same diameter throughout; the thick wall becoming gradually thicker distally: the perithecium slightly inflated, faintly brownish; the short, stout, broad, blunt tip slightly distinguished, and nearly symmetrical; the lip-cells forming an unbroken outline, without protrusions. Spores (male) 40 × 4 μ, (female) 60 × 6 μ. Perithecium 100–110 × 35–45 μ, the stalk-cell 75–115 × 18 μ. Receptacle including foot 35 × 12 μ, the sterile terminal cell 18–25 × 7–9 μ. Total length to tip of perithecium 185–220 μ.

On *Anthicus floralis* Linn. Fresh Pond, Cambridge. On *A. Californicus* Laf. California (Leconte Collection).

Of the three species which occur on *Anthicus* this is decidedly the most common and has been obtained in abundance near Fresh Pond where the hosts were found in piles of hay or weed. It usually occurs near the tips of the elytra and is subject to little variation. It is most nearly allied to *D. onchophorus*, but is easily distinguished by its perithecial characters. All of the three species which inhabit this host are sometimes found together on a single individual, but occupy more or less restricted regions.

DIOICOMYCES ONCHOPHORUS Thaxter. Plate XLII, figs. 26–29.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 34. June, 1901.

Male individual similar to that of *D. Anthici*, slightly smaller.

Female individual. Usually strongly curved, especially at the base of the stalk-cell; similar to *D. Anthici*; the receptacle, sterile cell, and the stalk of the perithecium, relatively smaller. Perithecium dirty brown, one of the lip-cells protruding in the form of a well defined, lateral, finger-like, erect, straight, or slightly curved, blunt-tipped, concolorous process; an irregular anterior elevation or angular prominence is also more or less well defined above the middle of the perithecium. Spores (male) 35 × 4 μ, (female) 45 × 5 μ. Perithecia to tip of projection 125–140 × 40–45 μ, the stalk-cell 90 μ. Total length to tip of perithecium 210–230 μ.

Usually on the basal half or at the base of the left elytron of *Anthicus floralis* Linn. Fresh Pond, Cambridge.

This species is readily distinguished by the characters of its perithecium, the general form of which is unlike that of the related *D. Anthici*, and which bears a terminal prominence not found in any other species. The sterile cell of the receptacle is also as a rule more pointed than in other species, and relatively somewhat smaller, and the perithecial stalk-cell is usually abruptly bent or twisted. It is less common than either of the other species on this host.

Dioicomyces spinigerus Thaxter. Plate XLII, figs. 30–34.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 34. June, 1901.

Male individual similar to that of *D. Anthici*, much smaller, the extremity less prominent, or almost horizontal, the discharge tube somewhat more slender, and more often erect. Total length including foot 40 × 6.5 μ; to tip of discharge-tube 47 μ.

Female individual. Receptacle relatively small, tinged with dirty yellowish, edged with brown to the tip of the small terminal sterile cell. Perithecium dirty yellowish and relatively large, considerably and more or less symmetrically inflated, above and including its basal cells, to the base of the tip, which is bent abruptly outward at right angles to the axis of the perithecium; the apex broad, blunt, the lip-cells hardly projecting: a unicellular brown, straight or slightly curved, spine-like process, which tapers to a blunt point, projects upward at an angle of about 45° from the middle of the outer (anterior) margin of the perithecium; and a slight elevation is also more or less distinct between its base and that of the tip; the stalk-cell, relatively short, becoming rapidly narrower toward its base. Spores (male) 26 × 4 μ, (female) 40 × 6 μ. Perithecia including basal cells 125 × 50 μ, the spinous process 55 μ, the stalk-cell 36–40 μ. Receptacle to tip of sterile cell about 45 μ. Total length to tip of perithecium about 185 μ.

On *Anthicus floralis* Linn., with the last two species, more commonly on the inferior surface of the abdomen. Fresh Pond, Cambridge.

This species is the most peculiar member of the genus and is at once distinguished by the spine-like outgrowth from one of the anterior perithecial wall-cells, as well as by other characters. It is a rather rare species, but sufficiently abundant material has been examined to show that its characters are quite constant.

Dioicomyces Floridanus Thaxter. Plate XLII, figs. 35–36.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 33. June, 1901. *Amorphomyces Floridanus* Thaxter, l. c., Vol. XXVIII, p. 159.

Male individual. Relatively large, long, brown, the discharge-tube long slender curved, the tip of the antheridial cell prominent beyond its base. Length 55 × 8 μ; the discharge-tube 24 μ.

Female individual. Color brown. Perithecium stout strongly curved inward the upper half nearly straight and symmetrical blunt-tipped; the stalk-cells lightly inflated, nearly isodiametric. Receptacle normal. Perithecium about 150 × 50 μ. Total length about 200 μ. Receptacle to tip of sterile cell, including foot, 65 μ.

Type on abdomen of *Bledius basalis* Lec., Florida, Henshaw Collection: on *Bledius* sp., Ipswich, Mass.

This species was originally described from a single female individual from Florida under the genus *Amorphomyces*, but proves to correspond in all respects to the type of the present genus. A single pair has been obtained from a small *Bledius* collected by Mr. Emerton on the sand dunes at Ipswich, and the male proves to be somewhat different from those of the other species in its brown color, larger relative size, and elongate curved discharge-tube. The female resembles that of *D. Anthici* more closely than it does either of the other species, but differs in its stouter form and the nearly isodiametric stalk-cell of its perithecium, as well as in its darker brown color.

Dioicomyces obliqueseptatus Thaxter. Plate XLII, figs. 16–17.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 33. June, 1901. *Amorphomyces obliqueseptatus* Thaxter, l. c., Vol. XXXV, p. 431. April, 1900.

Male individual, unknown.

Female individual, straw colored tinged with amber-brown. The perithecium broadly inflated at the base, becoming gradually narrower distally, the tip broad blunt asymmetrical; the apex somewhat oblique, the asci and spores in great numbers, filling the perithecium and developed from a single ascogenic cell. Spores obliquely septate, 40 × 7 μ. Perithecium 200 × 55–60 μ.

On the antennæ of an undetermined staphylinid perhaps near *Myrmedonia*, British Museum No. 398, Ega, Amazon River.

This form is undoubtedly a species of *Dioicomyces* as is indicated by its obliquely septate spores, and it is evident that practically the whole of the receptacle was broken off when the specimens were removed from the host. It is needless to say that the species would not have been described had this been evident at the time of its publication. Although thus based on a perithecium merely, with its stalk-cell and an adherent fragment of the receptacle, there should be no difficulty in its future recognition. The host was a very peculiar staphylinid among the Miscellanea in the British Museum, and was nearly allied to *Myrmedonia*.

SMERINGOMYCES nov. gen. XLII. 41-42

Male (?) *individual*: bristle-like consisting of several superposed cells.

Female (?) *individual.* Receptacle consisting of three or four superposed cells bearing a single terminal perithecium, the subbasal cell subtended by a bristle-like appendage, the cells above it also bearing similar appendages. Perithecium appendiculate, its cavity becoming continuous with that of the stalk-cell.

The type of this genus was provisionally placed in *Rhachomyces*, but there can be no doubt as to its distinctness, although it resembles it in possessing a receptacle consisting of superposed cells bearing bristle-like appendages. There being no other genus in which it can be even provisionally placed, I have reluctantly made a new one for its reception, although an adequate diagnosis is as yet impossible owing to a lack of any knowledge as to its antheridial characters. The form is rare and at the same time very minute, and I have as yet been unable to obtain young material in sufficient quantities to determine what these antheridial characters are. In all cases where this could be determined, the perithecigerous individual has been accompanied by a small bristle-like individual developed from the other member of the spore pair. This may represent an atrophied condition of an hermaphrodite individual, or may be a male. I have in no case seen paired normal individuals, which if they occurred, would indicate that the spores were not different in a given pair. The small individual resembles very closely the primary bristle-like appendage of the normal type, but possesses a very small foot. It is so opaque that I have found it impossible in the material examined to determine whether there is any structure which might be interpreted as an antheridium. It is also true that in no normal individual have I seen anything that could be similarly interpreted; yet in either case, owing to the small size and opacity of the structures involved, an antheridium might be present and yet be visible only in especially favorable individuals. That it is probably a unisexual type is indicated by the peculiar characters of its perithecium, the absorption of the basal cells of the latter, which results in making its cavity continuous with that of the stalk-cell, being a phenomenon seen only in diœcious genera. For this reason and in the absence of definite information to the contrary I have placed the genus provisionally in its present connection.

The youngest individual examined consists of four superposed cells terminated by a primary bristle-like appendage which seems to correspond to the appendage which at maturity occupies a position at the base of the perithecium. The third cell appears to produce appendages distally, and the fourth to give rise to the perithecium and the rest of the appendages, but the series of specimens is not complete enough to determine these matters with exactness. The axis is thus not of secondary origin as in *Rhachomyces*.

Smeringomyces anomalus nov. comb. Plate XLII, figs. 41–42.

Rhachomyces anomalus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 25. June, 1902.

Male (?) individual bristle-like, composed of about four superposed cells, nearly opaque, slender, tapering to the hardly differentiated small pointed foot.

Female (?) individual. Receptacle relatively small, consisting primarily of four superposed cells, tapering slightly to the relatively large pointed foot. The basal cell relatively large, the third bearing distally and posteriorly one or two stout bristle-like, simple, rigid, black-brown, hyaline-tipped appendages; the fourth cell becoming divided to several smaller cells from which arise, a usually less suffused primary external appendage, the perithecium, and one or two secondary bristle-like appendages: the appendages about five in all, relatively large, appressed, together more or less completely surrounding the base of the perithecium and extending nearly to its tip. Perithecium tinged with purplish brown, or nearly hyaline, the body relatively long, very slightly inflated, broader distally, tapering slightly to the blunt tip, from which the apex forms a long pointed, hyaline, lateral or subterminal projection toward a large curved, horn-like, stout, hyaline outgrowth of the perithecium, which, arising externally just below the tip, extends upward beyond the apex over which it is slightly recurved (or more rarely curved away from the tip), ending in a bluntly pointed extremity. Spores 46 × 4 μ. Perithecia 75–90 × 20–25 μ, the outgrowth 35–45 × 14 μ. The longer appendages 75 μ. Receptacles 35–45 μ. Total length to tip of perithecium 110–125 μ.

On *Conosoma pubescens* Payk., Waverley, Mass.

This species grows appressed on the scattered bristles which cover the body of its host and appears to be rather rare. Though minute, its form is strikingly peculiar owing to the beak-like apex and horn-like appendage of its perithecium. It is often associated on the same individual with the more common *Stichomyces Conosomæ*. The host is a small and very active Staphylinid which is found commonly in rotten wood.

ACOMPSOMYCES Thaxter. XLII. 5-15

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 37. June, 1901.

Receptacle two-celled, bearing an antheridial branch terminally and a single perithecium laterally. Antheridial appendage consisting of a stalk-cell wholly united to the receptacle, or nearly so, and three superposed cells which form the appendage proper: the terminal cell bearing distally a single spinose antheridium, the subterminal cell sterile and the lowest cell bearing distally two or three antheridia. Perithecium furnished with a stalk-cell, five and six wall-cells being present in the rows. Trichogyne producing clavate branches which bear distally several nearly spherical receptive papillæ.

Although the type of this genus is a very simple one, and the species differ within very narrow limits, it is extremely well marked, and essentially constant. The appendage, except for the sterile subterminal cell, is very like a simple form of *Stigmatomyces*, though the antheridia with their characteristic outcurved necks are not all produced on the same side of the appendage as in this genus, with which, however, it seems closely allied. The appearances seen in the original type (*A. Corticariæ*) of which but a single specimen was obtained, gave the impression that in this genus, as in *Dimorphomyces* or *Dimeromyces*, the basal cells of the perithecium became disorganized, so that the cavity of the stalk-cell and perithecium were confluent. Sufficient material, however, of other forms, shows that this is not the case, the basal cells being clearly defined at maturity. The species all appear to be rare, at least an examination of great numbers of hosts has yielded very few infested specimens, and in only two instances have young individuals been found. Three specimens, however, bear trichogynes (figs. 8 and 12, Plate XLII) that are unique from the peculiar differentiation of the receptive parts which appear as terminal spherical vesicles, as shown in the figures. The hosts are the smallest, with the exception of *Trichopteryx*, on which Laboulbeniæ have been found, and are common in piles of weed or grass etc.

ACOMPSOMYCES CORTICARIÆ Thaxter. Plate XLII, fig. 5.
Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 37. June, 1901.

Receptacle narrow below, distally enlarged, hyaline; the subbasal cell small. Basal cell of the appendage brown, distally narrowed to the base of the appendage proper, which is brown, and consists of three symmetrical cells, the upper smaller, bearing a terminal antheridium, the lower bearing several antheridia somewhat irregularly. Perithecium brown, rather abruptly distinguished from the short hyaline stalk; the tip very broad and darker; the lip-cells forming four hyaline-tipped, nearly symmetrical papillæ which terminate four corresponding ridges. Spores about 30 × 2 μ. Perithecia 90 × 26 μ, the stalk 15 μ. Receptacle 25 μ. Antheridial appendage, above stalk-cell, and including terminal antheridium, 40 μ.

On elytron of *Corticaria* sp. Berkeley, California.

This species is well distinguished by its color and form and especially the conformation of the tip of the perithecium. The unique type was found on a small *Corticaria* in a lot of small flies collected by sweeping near Berkeley.

ACOMPSOMYCES BRUNNEOLUS Thaxter. Plate XLII, figs. 10–12.
Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 311. July, 1905.

Colorless, the tip of the perithecium and its posterior margin suffused with brown, the suffusion extending to the base of and including the appendage. Receptacle short, the basal cell hyaline, relatively large, slightly inflated above, tapering to the small foot; the subbasal cell very small, twice as broad as long; the basal cell of the appendage deeply suffused with blackish brown, especially externally; relatively small and short, the rest of the appendage much as in the other species, somewhat narrow and suffused with brown. Stalk-cell of the perithecium short, slightly longer than broad, the perithecium relatively large and stout, nearly straight, the inner margin nearly straight, and suffused with brown, the outer bent abruptly inward below the tip, which is brown, short, stout, well differentiated, broadly truncate; the lip-cells rising in a truncate conical apiculus subtended by the four clearly distinguished broad subterminal wall-cells. Total length to tip of perithecium 125 μ. Perithecium 80 × 20 μ, the stalk-cell 12 × 10 μ. Receptacle 28 × 12 μ. Appendage to tip of spine 45 × 10 μ, the basal cell 10 μ long.

Near the base of the right elytron of *Corticaria* sp., Kittery Point, Maine.

Several specimens of this pretty species were found on a single host on Cutts Island, but although diligent search was made no further material has been obtained.

ACOMPSOMYCES PAUPERCULUS Thaxter. Plate XLII, figs. 13–15.
Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 23. June, 1902.

Hyaline or nearly so. Receptacle short, somewhat bent; the distal cell very small, irregular, sharply pointed below, externally separated from the basal cell by an oblique septum; the basal cell three or four times as large, narrow below, expanded above its distal point, forming a right angle, the septum on one side applied to the base of the stalk-cell of the appendage. The latter subtriangular, its lower half in contact on the inner side with the two cells of the receptacle, its upper with the stalk-cell of the perithecium; the rest of the appendage free, relatively large, hardly inflated, its lower cell about as large as the two upper combined and bearing commonly one, sometimes three, antheridia as in *A. Atomariæ;* the two cells above it nearly equal or the upper often smaller and bearing its antheridium subterminally, so that the spinous process of the latter appears to terminate the appendage, the wall distinguishing this antheridium being commonly invisible from its obliquity. Stalk-cell of the perithecium about as large as that of the appendage and similarly shaped, except that its position is reversed, separated distally from the basal cells of the perithecium by a very oblique septum: the body of the perithecium short, stout, bent asymmetrically, and considerably inflated; the inner margin straighter, the short squarish tip rather abruptly distinguished, the apex subtended by four distinct symmetrical prominences, which form a crown surrounding the four appressed prolongations of the lip-cells, which appear as a blunt, conical protuberance within it: all the cells rather thin-walled. Spores 45 × 4 μ. Perithecia 70 × 30–35 μ, the stalk-cell 12–18 × 9. Receptacle 20–30 μ. Free appendage 32–36 μ. Total length to tip of perithecium 110 μ.

On elytra, prothorax, and legs of *Atomaria* sp., Kittery Point, Maine, June.

This species, which has been found but twice, is distinguished by its hunched bent form and pale straw-color. The venter of the terminal antheridium is usually so small, or so obliquely placed as to be almost indistinguishable, and the terminal cell of the appendage might readily be taken for it. On a very minute brown *Atomaria* at Cutts Island.

ACOMPSOMYCES ATOMARIÆ Thaxter. Plate XLII, figs. 6–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 22. June, 1902.

Colorless or very faintly brownish. Receptacle short, the distal cell squarish; the basal cell twice as large, narrow below, bulging beneath the base of the antheridial appendage from which it thus appears to arise terminally. Basal cell of the antheridial appendage rather long and narrow, not distinguished from the receptacle, to the distal cell of which its lower half is closely applied, while its upper half is in equally close contact with the stalk-cell of the perithecium; the rest of the appendage free, compact, slightly inflated, with evenly curved outline, faintly tinged with brown, consisting of three cells: the lower subtriangular in outline with the largest angle outward, bearing distally three closely appressed antheridia neither of which arises from its outer side; the cell next above somewhat larger, sterile, subtriangular with the largest angle external; the terminal cell smaller, separated by a horizontal septum from the terminal antheridium, the neck of which is curved inward, the spinous process conspicuous and external. Stalk-cell of the perithecium well developed, rather slender, about as long as the receptacle, the basal cells well distinguished: body of the perithecium narrower below, its inner margin nearly straight with slight constrictions at the septa, the outer bulging distinctly and more or less symmetrically; the tip distinctly but not abruptly distinguished, short, stout, slightly but rather abruptly expanded below the flat-conical apex, from the middle of which project abruptly the small short appressed prolongations of the lip-cells, forming a terminal apiculus. All the cells thick-walled. Spores very slender, 44 × 3 μ. Perithecia 36–46 × 25–30 μ, the stalk-cell 25–30 × 10 μ. Receptacle 25 μ. Free appendage to tip of spinous process 36 × 12 μ. Total length to tip of perithecium 125–150 μ.

On elytra of *Atomaria ephippiata* Zimm., Kittery Point, Maine, and Intervale, N. H.

POLYASCOMYCES Thaxter. XXXVIII 1-2

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 414. April, 1900.

Receptacle consisting of two superposed cells, the upper bearing a perithecium laterally and an appendage terminally. Appendage consisting of a series of superposed flattened cells, surmounted by a dome shaped portion which is not persistent. Perithecium with a distinct stalk-cell and well developed basal cells, the supporting cell and the lower wall-cells forming a funnel-shaped ascigerous area, the asci arising from very numerous ascigerous cells.

It has not been possible from the material available to determine what the precise nature of the antheridial appendage is, or even to decide whether the antheridia are compound or simple. The terminal dome-shaped portion of the appendage may have been a compound antheridium, which early becomes collapsed and disorganized, and I was at first inclined to consider it as such; but it is equally possible that it may have given rise to simple antheridia, or that these may have been produced from some of the cells below in a fashion somewhat similar to that seen in *Acompsomyces* and *Acallomyces*, to the last of which it seems otherwise as closely allied as to any of the genera. It has therefore seemed best to place it among the Laboulbeniaceæ although, such a disposition must be considered as merely provisional. The genus is chiefly remarkable for the unusual multiplication of ascogenic cells, which are far more numerous than in any other. The original position of these cells is probably not that which is shown in the accompanying figures; since it seems probable that in the specimens examined the whole mass has been displaced from a position lower down, nearer the base of the funnel-shaped cavity below. As far as can be determined by an actual count, there appear to be not less than thirty-two such ascogenic cells in a single perithecium, and perhaps more in some individuals.

Further knowledge of this very peculiar type is much to be desired, and it is to be hoped that English observers may be able to obtain material of young individuals which will make it possible to determine the nature of the antheridium. The host of the unique species is a staphylinid allied to *Tachinus* and appears to be rare in collections, although it is well represented in that of Dr. Sharp, in which, however, much to my regret, I was unable to discover any individuals that were infested.

Polyascomyces Trichophyæ Thaxter. Plate XXXVII, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 415. April, 1900.

Pale dirty brownish. Perithecium broadest in the ascigerous zone, tapering thence to the distinctly differentiated neck-like tip, the subterminal wall-cells enlarged distally, externally and laterally, the resultant rounded protuberances forming a ridge about the tip just above its middle, the distal portion, formed by the lip-cells, of which that on the right is slightly longer than the rest, broad blunt brownish, the other three somewhat shorter terminating in narrow blunt extremities which lie on three sides of the first. The stalk-cell similar to and lying beside the subbasal cell of the receptacle to which it is united throughout, its base being in contact with the distal end of the basal cell, while from its distal end the large basal cells of the receptacle curve abruptly outward and upward. The appendage consisting of from three to six flat superposed darker brown cells, constricted at the septa, looking as if they had been made irregular by crushing, the terminal portion (antheridium?) blunt, slightly longer than broad, with evidences of lateral apertures. Spores 28 × 2.5 μ. Perithecia 175 × 50–65 μ. Basal cells 40–48 × 30 μ. Stalk 38 μ. Receptacle 70 μ. Appendage 48–60 × 20–24 μ.

On the superior surface of the abdomen of *Trichophya pilicornis* Gyll., British Museum, No. 453, Farnham, England.

ACALLOMYCES Thaxter. XLII 1-4

Proc. Am Acad. Arts and Sci., Vol. XXXVIII, p. 23. June, 1902.

Receptacle consisting of two superposed cells, the lower sometimes obsolete or indistinguishable from the foot, the upper bearing a single perithecium and an antheridial appendage. Appendage clearly differentiated, simple and without branchlets, consisting of an adnate stalk-cell and five cells superposed above it, the two terminal ones each bearing a single antheridium, the terminal antheridium spinose, the subterminal one adnate to the terminal cell of the appendage.

A very simple generic type closely allied to *Acompsomyces* and also resembling *Stigmatomyces* in the characters of its appendage. The latter appears to be similarly distinguished by the presence of a stalk-cell, a basal cell and several (four) cells superposed above it. The two antheridia are superposed and appear to have been separated from the terminal and subterminal cells. Although it is difficult to point out crucial differences which separate this appendage clearly from that of *Stigmatomyces,* unless it be the sterility of the four lower cells, there can be no question of the distinctness of the generic type, which is in reality nearer that of *Acompsomyces.* In this, however, the subterminal cell of the appendage is sterile and the cell below this bears more than a single antheridium. The type bears a very strong resemblance to *Polyascomyces*; but, since nothing is known as to the true character and disposition of the antheridial cells in this genus, the relationship remains problematical.

Acallomyces Homalotæ Thaxter. Plate XLII, figs. 1–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 24. June, 1902.

Hyaline becoming faintly tinged with straw-yellow. Receptacle very small the lower half becoming tinged with smoky brown; the basal cell hardly distinguished from the foot, and commonly obliterated by a thickening of the walls in this region, so that the receptacle appears to be one-celled. Basal cell of the antheridium separated from the distal cell of the receptacle by a somewhat oblique septum, and nearly similar to that of the stalk-cell of the perithecium, to which it is closely adnate on its inner side. the subbasal cell very small and becoming scarcely distinguishable in mature individuals; the two cells above it similar, rather distinctly differentiated, the pair forming a slight symmetrical enlargement; the terminal cell above, larger and longer than these two cells combined, the base of the lower antheridium extending its whole length; both this and the terminal antheridium above it relatively large, the necks very long, straight or but slightly bent and somewhat divergent. Stalk-cell of the perithecium somewhat broader than long, the basal cells small, the perithecium proper relatively large and somewhat inflated above the base, distally tapering gradually to the tip; the lip-cells forming four corresponding projections, the anterior larger and broader, the posterior narrow and bluntly pointed, subtended by a more or less well defined hump; the two lateral usually shorter blunt, slightly divergent, sometimes not clearly differentiated, varying in shape and position. Spores 35 × 3.5 μ. Perithecia 75–95 × 25–32 μ, the stalk-cell 10–12 μ. Appendage above basal cell to tip of antheridium, 36 μ. Antheridia 21–25 μ. Receptacle 20–25 μ. Total length to tip of perithecium 125–150 μ.

On the superior surface of the abdomen of a species of *Homalota*. Intervale, N. H.

This species appears to be very rare, since, although diligent search was made for it, a single infested specimen of the host, only, was found. The latter occurred in decaying agarics in the Merriman Woods.

STIGMATOMYCES Karsten.

XLVI., XLVII., XLIX. 8–24.
I. p. 298

A notable addition is made to this genus since the publication of my Monograph, including nineteen species, a majority of which are either American forms, or derived from a collection of Diptera made by Dr. Dahl in New Pommerania near New Guinea. All of the species, with a single exception, grow upon flies, and it is quite certain that those which have been described represent but a small fraction of the forms which actually exist. The genus is in some respects a very difficult one to treat systematically, the type-structure being very simple, and the species sometimes varying very greatly; as in the case of *S. purpureus*, which, although in its typical condition it is one of the most striking and clearly defined forms, both from its peculiar violet-blue or purple color and the nodulose ridges of its perithecium, varies to smaller and simpler conditions in which these characters are almost wholly lost.

The antheridial appendage in this, as well as in so many other genera, furnishes the most reliable characters, not only for the characterization of the genus, but of the different species as well, and possesses a very well marked and individual type of structure. It consists of a *stalk-cell* more or less well developed and always partly or usually wholly united to the receptacle, that is succeeded by a *basal cell* which is usually, although not invariably, peculiarly modified in color and in structure. The characteristic cup-like thickening of the inner layers of the wall of this cell, above the basal septum, which is so strikingly developed in *Arthrorhynchus Cyclopodiæ*, is often prominent, as in fig. 22, Plate XLVII, is perhaps connected with the mechanism by which the whole appendage undergoes a quarter or a half turn; so that the antheridia, which were originally directed toward the trichogyne, become turned away from the mature perithecium. This basal cell, which may or may not itself bear antheridia, as is shown in figs. 18 and 36, Plate XLVI, is succeeded above by a series of superposed cells which form the main axis of the appendage and vary in number in the different species.

The simplest type of appendage is that illustrated by *S. purpureus*, Plate XLVI, fig. 36, in which the basal cell is not only unmodified but sterile, the axis above it consisting of but three superposed cells, each bearing a single antheridium; the series ending in a fourth terminal cell which is converted directly into a spinose antheridium. The spine, which persists in a similar fashion in various other genera, notably in *Eucantharomyces*, being the original subulate termination of the germinating spore, it is evident that the cell which bears it is a primarily terminal structure and not one which has resulted from secondary proliferation. In this connection, however, it should be mentioned that the spine is not always attached to a terminal cell and the different species may be in general divided in two groups, one in which the spinose cell is terminal at maturity as in figs. 1, 7, 36, 41 etc., Plate XLVI; and a second class in which, through a process of secondary proliferation more or less pronounced, the spinose cell becomes intercalary, and the number of cells forming the axis of the appendage correspondingly increased in number, as in fig. 29. In this class also two types may be distinguished namely that in which all the cells of the axis, at least above the basal cell, bear fertile antheridia, whether they be primary or secondary, as in the figure last cited, and those in which the accessory cells of the axis are partly or wholly sterile, producing no antheridia or only sterile ones, as in figs. 7 and 13, Plate XLVII.

In regard to the development, arrangement and number of the antheridia on the appendage, there is a good deal of variation in different cases, but these characters appear to be more or less definitely fixed in individual species, so that the appendage characters are often the only reliable ones. The simplest type of arrangement is that seen in *S. purpureus* previously cited, in which each cell of the axis having cut off a single antheridium, the latter form a series of members superposed in a single row. This type, however, is rarely met with, and in the great majority of cases a more or less complete double row is formed. This condition usually results from the fact that from some or all of the cells which compose the primary axis, a second cell is cut off which corresponds to the single antheridium of the simpler type and like it is morphologically a lateral branch. This branch then divides in two superposed cells, the terminal one being converted directly to an antheridium. The basal cell in turn may then grow out sidewise and form a second antheridium on which the first appears to be superposed, or may itself become divided to an upper and lower cell each of which is transformed to an antheridium, as appears to be the case in *S. Elachipteræ*. The antheridia formed in this manner becoming somewhat divergent as they mature, thus come to be more or less regularly biseriate and alternate. These antheridial sympodia from the main appendage correspond in all respects to the corresponding structures of *Rhadinomyces*, in which the antheridia arise successively in a similar fashion (Monograph, Plate IX, fig. 23), although they are quite free and usually more than two are superposed.

In describing the species it has been found convenient to distinguish three regions in the perithecium although they are not well marked in all cases. These are the *venter*, the more or less swollen ascigerous basal part, the *neck* often abruptly distinguished and elongate above it and lastly the *tip* which is commonly distinguished from the neck by a more or less well defined elevation. A typical instance of this separation into three regions is seen in the perithecium of figs. 12 and 16, Plate XLIX. In several species the venter is marked by granulations or transverse lines as in the figures last cited, but this is often indistinct without a high magnification. The hosts of the members of this genus are mostly small flies many of which, as their names suggest, live near water or in moist places, while others may be swept with a net from various flowers or over grass etc., in somewhat dryer situations. It will be remembered that *S. virescens* occurs on a widely different host, *Chilocorus*, one of the "lady beetles," and I have one other species as yet undescribed which occurs in South America on another order of Coleoptera. It may be mentioned here that, although the species almost all grow on soft bodied hosts, no indication has been seen of any penetration of the integument such as is suggested by the figures of Peyritsch, and the foot is of the usual type, though often small.

STIGMATOMYCES PURPUREUS Thaxter. Plate XLVI, figs. 30–36.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 404. March, 1901.

Becoming wholly suffused with purple. Venter of the perithecium inflated toward the base, tapering distally; the four wall-cells separated by a corresponding number of prominent longitudinal ridges, rounded in section, which run spirally, making in well-developed individuals a whole half turn about the venter, and becoming sometimes lobulated through the presence of successive constrictions and enlargements; neck not abruptly distinguished, except by the abrupt elevations which form the terminations of the longitudinal ridges of the venter, rather slender, an abrupt posterior subterminal elevation preceded by a slight constriction, the tip distally quite hyaline; the apex becoming furcate through the presence of an anterior (shorter) and a posterior projection. Stalk-cell of the appendage relatively small, but slightly prominent below the basal cell, which is nearly as long, sterile, and, as a rule, followed by three cells bearing antheridia singly, the terminal one spiniferous. Receptacle usually straight, the cells nearly equal or the upper larger. Spores 35 × 3 μ. Perithecium: venter 80–100 × 45–50 μ; neck 80–83 μ. Appendage 55 μ, the stalk-cell 18 μ. Receptacle 100–120 μ. Total length to tip of perithecium 200–325 μ.

On all parts of *Scatella stagnalis* Fallen; Berkeley, California; Intervale, New Hampshire; Kittery Point, Maine, and vicinity of Cambridge, Mass., September.

Fully developed individuals with the typical structure are uncommon, a majority of the numerous specimens examined having the color dull or paler purplish, the ridges less well defined, without lobulations and with less than a half twist; the neck and apex hardly, if at all, modified. The same host is infested by an amber-brown form which may prove a mere variety of that above described, being scarcely distinguishable structurally from the less well-marked individuals of this species, the type form of which is, from its remarkable color and from the structure of its perithecium, one of the most peculiar members of the genus. It is most nearly allied to *S. Hydrelliæ*, the appendages in these two species being nearly identical. *L. spiralis* also has certain characters in common with it, as for example its ridged perithecium and uniseriate antheridia; but cannot be confused with it. The spinose cell is terminal and becomes an antheridium. The hosts are small flies with brownish wings abundant in moist places, especially about mud holes, and may be captured, by sweeping, in great quantities, especially in late August and September.

STIGMATOMYCES HYDRELLIÆ Thaxter. Plate XLVI, figs. 19–24.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 404. March, 1901.

Venter of the perithecium amber-brown, oval, the wall-cells becoming separated by well-defined, slightly oblique longitudinal broad ridges, which become broader distally where they end abruptly; the neck pale, well distinguished, its middle third prominently inflated, more so posteriorly, and separated from the usually abruptly bent tip by a constriction; the apex rounded, one of the (lateral?) lip-cells, forming a slender, bluntly pointed, well-defined free projection. Stalk-cell of the appendage sub-triangular, somewhat prominent below the basal cell, which nearly equals it in length and is sterile; the fertile cells above it nearly equal, bearing rather large, single, antheridia, with stout, straight necks, the series ending in a terminal spiniferous antheridium. Receptacle hyaline, the two cells nearly equal in length, the lower tapering below, the upper broader inflated, its diameter greater than the base of the perithecium and stalk-cell combined, so that the latter region appears to be constricted. Spores 28 × 2 μ. Perithecium: venter 50–55 × 33–40 μ; neck 40–43 μ. Appendage 50 μ, the stalk-cell 18 μ. Receptacle 55–65 × 20–22 μ. Total length to tip of perithecium 150–185 μ.

Occurring in scattered groups on the superior surface of the abdomen, sometimes on the legs, of *Hydrellia* sp. Kittery Point, Maine.

This species is closely allied to *S. purpureus*, the appendages being identical in the two species. The conformation of the perithecium appears to separate it, however, very distinctly. It seems to be rare in the type locality and has not been seen elsewhere. The host may be captured by sweeping in moist places about ponds.

STIGMATOMYCES SPIRALIS Thaxter. Plate XLVI, figs. 25–29.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 405. March, 1901.

Venter of the perithecium relatively long and slender, flask-shaped, or more often but slightly if at all inflated, the granular wall-cells distinguished by a corresponding number of abrupt, narrow, longitudinal prominent ridges, which become minutely roughened, and are spirally twisted so as to describe a full half turn; the neck concolorous, distinguished by the abruptly elevated and abruptly broadened terminations of the longitudinal ridges of the venter, as long as or slightly shorter than the venter, slightly curved or sometimes straight, nearly cylindrical or slightly tapering; the tip slightly but abruptly narrower, relatively short, somewhat asymmetrical; the apex nearly symmetrical, four papillæ being arranged about a somewhat more prominent central projection. Appendage rather short and stout, distinctly broadened in the middle, the stalk-cell, stout, the basal cell half as large, or less, and fertile; the series of six to eight fertile cells above it surmounted by a single usually sterile antheridium, and distinguished by slight successive constrictions, broad and much flattened, each bearing a single antheridium, the fifth furnished with a very sharp spine; the antheridia forming a usually lateral series, their necks becoming strongly curved. Receptacle elongate, slender, becoming brownish or yellowish, the upper cell often more than twice as long as the basal. Spores 25 × 2.5 μ. Perithecium: venter 90–165 × 35–47 μ; neck 90–160 × 17 μ (the tip 25–30 μ). Appendage 40–50 μ, the stalk-cell 15 μ. Receptacle 100–250 × 15 μ. Total length to tip of perithecium 350–600 μ (average 500–550 μ).

On *Hydrina* sp., Kittery Point, Maine. Usually on the upper surface of the thorax, less often on the legs and elsewhere.

This well marked species was obtained on a small fly collected by sweeping the flowers of Yarrow (*Achillea*) on Cutts Island in late August. It is conspicuous from its large size and dark brown perithecium, and may readily be seen with the naked eye when growing in its usual position on the thorax. It is distinguished by the clean cut wing-like ridges which run spirally between the wall-cells and end abruptly in an enlargement at the base of the neck. In this respect it resembles *S. purpureus*, in which the ridges are, however, nodulose when well developed, as well as in the uniseriate arrangement of its antheridia; but is in other respects quite different. The spiniferous cell is not converted into an antheridium, but is subterminal; the appendage being proliferous beyond it.

STIGMATOMYCES VENEZUELÆ Thaxter. Plate XLIX, figs. 20–21.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 314. July, 1905.

Perithecium slender, curved throughout, the venter pale amber-brown, hyaline externally, not distinguished from the neck on the inner side; the outer wall-cells bulging more or less conspicuously; the neck tapering slightly, the tip blunt, and unmodified; the basal and stalk-cells hyaline, distinguished from the venter by an abrupt external constriction. Cells of the receptacle hyaline, subequal, the basal bulging distally, below the subbasal, to which it is thus asymmetrically adjusted. Stalk-cell of the appendage tinged with amber-brown, more than twice as long as broad, abruptly distinguished from the lower part of the basal cell, which is small and brown: the appendage proper small, hyaline, withering at maturity, except the lower part of the basal cell; consisting apparently of about three cells producing about four nearly free antheridia. Perithecia 95 × 30 μ. Receptacle 90 × 14 μ. Appendage 45 μ, exclusive of stalk-cell, which is 22 μ long.

Growing at tip of abdomen of *Limosina* sp., Island of Margarita, Venezuela; Dr. A. F. Blakeslee.

Although not striking in its appearance, this species seems well distinguished from all other forms of *Stigmatomyces*, owing to the peculiar relation between the basal and subbasal cells of the receptacle, as well as by the form of its perithecium. Eight mature individuals have been examined, which show little variation; but in none of them is the antheridial appendage sufficiently well preserved to admit of its being figured in detail, the whole functional portion apparently becoming shriveled and the antheridia ceasing to function at an early stage in the maturity of the individual. In one example it seems as if the lower antheridia, only, had been functional, and the upper were replaced by sterile rounded cells.

STIGMATOMYCES DIOPSIS Thaxter. Plate XLIX, figs. 8–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 399. March, 1901.

Colorless or slightly yellowish. Venter of the perithecium long-oval or elliptical, pale reddish amber, rather abruptly distinguished from the paler neck, which tapers but slightly, except at its base, is straight or slightly bent, and traversed by four broad longitudinal ridges which are corrugated by about six successive elevations and depressions; a seventh distal elevation, larger and more prominent than the rest, is present just below the tip, which is abruptly narrower and slightly curved; the apex asymmetrical, the posterior lip-cells forming a tripapillate prominence, the middle papilla larger and more prominent; the anterior lip-cells forming two small lateral papillæ placed side by side in such a position that the apex appears to be laterally notched. Appendage erect or somewhat divergent, straight or slightly curved backward, the stalk-cell more than twice as long as broad, and more than half united to the subtriangular stalk-cell of the perithecium, distally constricted at its junction with the well differentiated squarish amber-brown sterile basal cell of the appendage proper; the eight fertile cells above bearing two antheridia each in addition to a terminal pair, the outer of which is spinose at its base, the series of antheridia external in the mature types. Spores about 40–45 × 5 μ. Perithecium: venter 80–87 × 50 μ; neck 72–82 × 18 μ. Appendage proper 70–75 μ, stalk-cell 25–30 μ. Receptacle 75 μ. Total length to tip of perithecium 270–290 μ.

On *Diopsis* sp., Berlin Museum, No. 860; Bismarkburg, Togo, West Africa. On the upper surface of the abdomen near the tip.

This species is easily distinguished by the corrugated neck of its perithecium which is unlike that of any known form. It is the fourth species of the family now known to inhabit these curious stalked-eyed Diptera. The appendage is relatively large with very numerous antheridia, the multiplication of its cells not being due to proliferation since the spiniferous cell is terminal and appears to bear two antheridia (fig. 10).

STIGMATOMYCES GRACILIS Thaxter. Plate XLVI~~I~~, figs. 15–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 403. March, 1901.

Form long and slender. Venter of the perithecium amber-brown, relatively large above its narrow base, more or less inflated, often more distinctly distally; the neck usually straight, sometimes curved, nearly hyaline as a rule, and abruptly distinguished; the tip abruptly but slightly narrower above a prominent and usually symmetrical inflation; the median posterior projection of the lip-cells erect, larger, and slightly more prominent than the two lateral ones, which diverge slightly and are nearly symmetrical with the two anterior ones. Stalk-cell of the appendage slightly prominent distally below the dark amber-brown basal cell, which may be more than half as large, bearing one or two antheridia; the remaining cells four in number, relatively large, except the fourth, which bears a large, curved, conspicuous spine below the base of the terminal antheridium; the antheridia in pairs, lateral or obliquely external, the necks short, becoming pointed and slightly divergent. Receptacle usually shorter than the perithecium, slender, straight or curved, hyaline; the two lower cells about equal, or the upper larger and distally often broader than the combined diameters of the cells above it. Spores 45 × 3.5 μ. Perithecium: venter 85–90 × 30–40 μ; neck 100–110 × 16 μ (the enlargement × 20 μ). Appendage 70–75 μ, stalk-cell 18–25 μ. Receptacle 90–125 × 18–20 μ. Total length to tip of perithecium 250–360 μ.

Near the tips of the posterior legs on the same host with *S. dubius*. Ralum, New Pomerania. Berlin Museum, No. 1298.

This species appears to be most nearly allied to *S. Sarcophagæ*, from which it is separated by its general form, and by the structure of its appendage, which is not proliferous; the terminal antheridium being subtended by an unusually large stout thorn-like spine.

STIGMATOMYCES SCAPTOMYZÆ Thaxter. Plate XLVI, figs. 37–41.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 400. March, 1901.

Venter of the perithecium becoming reddish amber-brown, nearly isodiametric, becoming distally enlarged; the nearly hyaline neck very abruptly distinguished, slender, straight, or curved, its lower third sometimes narrower; the tip hardly or not at all differentiated; the apex asymmetrical, the anterior lip-cells forming two lateral papillate slightly divergent protrusions, the posterior lip-cells forming two similar protuberances above them, between which a slight projection may or may not be present. Stalk-cell of the appendage elongate, very abruptly broader than the very small deep brown squarish infertile basal cell; the fertile cells usually five in number, the antheridia with short curved divergent necks and produced in pairs, except the terminal one, which is conspicuously spiniferous, the whole series usually obliquely external. Receptacle hyaline, the basal cell mostly larger, longer, tapering below. Spores about 36 × 3.5 μ. Perithecium: venter 90–100 × 36–44 μ; neck 108 × 10–15 μ. Appendage 47–55 μ, the stalk-cell 25–30 μ. Receptacle 65–100 μ. Total length to tip of perithecium 300–325 μ.

On the abdomen and legs of *Scaptomyza graminum* Fallen. Kittery Point, Maine; vicinity of Cambridge, Mass.; Berkeley, California. On *Scaptomyza* sp.?, Caracas, Venezuela. (Blakeslee).

A very characteristic and common species usually growing in tufts on the upper or lower surface of the abdomen, the specimens from the three somewhat remote regions above indicated not showing any noteworthy regional variations. It is distinguished by its compact tapering appendage, with biseriate antheridia, and the unusually abrupt distinction between the rather slender neck and the distally often very considerably broadened venter of the perithecium. The host is common in New England during the late summer and autumn and may be readily captured by sweeping over flowers like mignonette or clematis or in grassy meadows. The South American specimens do not appear to be essentially different, although somewhat more long and slender, the distal portion of the venter rather abruptly swollen and slightly granular. The spiniferous cell in this species is terminal and becomes an antheridium, fig. 41.

Stigmatomyces pauperculus Thaxter. Plate XLIX, figs. 18–19.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 313. July, 1905.

Short and stout, dark amber-brown, except the hyaline receptacle, and the antheridial portion of the appendage. Venter of perithecium short, stout, inflated; more or less distinctly granular, abruptly distinguished from the neck, which is slightly inflated above the middle, distally curved, and slightly tapering; the apex somewhat asymmetrical and blunt, the lip-cells forming inconspicuous papillæ. Receptacle hyaline, rather short, the cells subequal, abruptly distinguished from the parts above. Stalk-cell of the appendage short and prominent, separated from the darker basal cell by an abrupt constriction; the rest of the appendage very broad, short, hyaline, curved inward; consisting of three superposed cells and the terminal antheridium, the total number of antheridia eight (possibly nine), scarcely more than their small necks free. Total length to tip of perithecium 165–175 μ. Venter of perithecium 40–45 × 35–38 μ, the neck 50 × 16 μ. Appendage, (including basal cell 16–20 μ), 58–65 × 15 μ. Spores 32 × 3 μ.

On legs of a small dark fly with white inferior abdomen, Ralum, New Pomerania; Berlin Museum, No. 1291.

Although based on only three specimens this species seems sufficiently well marked, by its broad fan-like antheridial appendage, to warrant separation from other known forms. It should be remembered, however, that abundant material may show a greater development in luxuriant specimens, both of the receptacle and perithecium. The terminal antheridium is spiniferous.

Stigmatomyces micrandrus Thaxter. Plate XLVII, figs. 19–24.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 312. July, 1905.

Venter of the perithecium, together with its basal cells and the stalk-cells of the appendage, dark amber-brown, symmetrically oval, or typically subconical; at maturity roughened by numerous transverse, not very prominent, ridges; the neck usually longer than the venter, slender, nearly cylindrical above its slightly spreading base, and usually more or less distinctly curved; the tip slightly narrower, and subtended by slight elevations, distally asymmetrical, somewhat oblique, the lip-cells prominent, somewhat pointed and divergent, subtending a pointed prominent apex. Basal cells of the perithecium small, subequal, and characteristically prominent. Receptacle typically rather short and stout, the two cells subequal, or the subbasal cell more or less elongate, finally more or less distinctly marked by transverse striations. Stalk-cell of the appendage rather short, more or less prominent: the basal cell abruptly narrower, squarish, brown, the rest of the appendage short and stout, hyaline, consisting of two superposed cells, the lower bearing three antheridia, the upper two, which are surmounted by the single terminal spinose antheridium. Spores 45 × 4 μ. Perithecium, venter 72–80 × 50–60 μ, the neck 140–150 × 16–18 μ. Appendage above stalk-cell 35–40 μ; the stalk-cell 20 μ. Receptacle 90–110 × 30 μ. Total length to tip of perithecium 275–325 μ.

On the superior surface of the abdomen of a small blackish fly, Ralum, New Pomerania; Berlin Museum, No. 1284.

Although in its typical form (fig. 20) this species seems very unlike the typical *S. rugosus*, more slender and elongate specimens occur which have made me hesitate to separate them specifically. The characters, of the antheridium, however, seem constantly different as indicated in the accompanying figures; and while that of *S. rugosus* possesses five superposed cells above the basal cell (fig. 27), bearing in all twelve antheridia, the present species has but two bearing six antheridia, and in one or two small specimens there seem to be even less. The spinose cell is terminal and becomes an antheridium.

STIGMATOMYCES RUGOSUS Thaxter. Plate XLVII, figs. 25–28.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 398. March, 1901.

Venter of the perithecium dark amber-brown, roughened by about ten transverse more or less irregular and sometimes anastomosing darker ridges formed by irregular wart-like elevations; evenly oval or elliptical, and abruptly distinguished from the rather stout neck, which is usually bent outward and about equal to it in length or somewhat shorter, distally distinctly enlarged, especially posteriorly; the tip beyond this enlargement abruptly somewhat narrower, distally asymmetrical, the two posterior lip-cells forming two corresponding projections, rounded or bluntly pointed and more prominent than the bilobed papilla formed below them by the anterior lip-cells the four subtending a slightly prominent apex. Stalk-cell of the appendage small, subtriangular, amber-brown, abruptly prominent below the relatively large dark brown basal cell, which, though narrower, nearly equals it in size, may or may not bear antheridia, and has a well-marked annular thickening on the inner side of its wall at the base; the fertile cells above it, four or five in number, bearing the rather large antheridia in pairs; the series becoming obliquely lateral or external, the free necks strongly curved outward. The cells of the receptacle nearly equal, or the upper larger; the basal cell tapering to the foot and distally slightly broader than the subbasal cell. Spores about 40 × 4 μ. Perithecium: venter 72 × 45 μ; neck 62–72 × 15–18 μ. Appendage proper 60–70 μ, stalk-cell 18 μ. Receptacle 90–100 × 20 μ. Total length to tip of perithecium 250–290 μ.

On the legs, thorax, and abdomen of a minute fly. Berlin Museum, No. 1296. Ralum, New Pomerania.

A form (fig. 28) which I am unable to separate satisfactorily from this species, was obtained from a small fly sent me by Dr. Piper from Puyallup, Washington; and I have found a similar one at Kittery Point, Me. The material is not very abundant but the species seems too near *S. rugosus* for specific separation. The type from Ralum, figs. 25–26, is very nearly allied to *S. micrandrus*; but differs in the several points referred to under that species. The spinose cell is intercalary, being the fourth above the basal cell of the appendage.

STIGMATOMYCES CONSTRICTUS Thaxter. Plate XLVI, figs. 1–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 401. March, 1901.

Venter of the perithecium dark amber-brown, subrectangular, or more or less inflated; the short stout neck about equal to it in length, very abruptly distinguished beyond the four rounded elevations which mark the distal ends of the brown wall-cells of the venter, subconical, with a considerable submedian enlargement often more prominent posteriorly; the tip often tapering to the five-papillate apex, the middle posterior papilla blunt and more prominent, the other four nearly symmetrical. Stalk-cell of the appendage often suboblong and externally prominent throughout its length, or only distally; the basal cell narrower and longer, separated from it by a rather deep constriction and bearing three antheridia distally: while above it the single remaining fertile cell is very small, bearing two antheridia and followed directly by the spinose terminal antheridium; all the antheridia relatively large and almost free. Receptacle hyaline, its basal cell more or less elongate, tapering to a narrow base, a rectangular distal thicker-walled portion separated by a thin incomplete septum; the subbasal cell much shorter, more or less abruptly and prominently inflated at its base, sometimes slightly also at its distal end, and having a more or less well defined median constriction, below which the inflated base may be separated by a thin partial septum. Perithecium: venter 54 × 30–40 μ; neck 44–55 × 18 μ. Appendage 43–50 μ, the stalk-cell 18 μ. Receptacle 70–90 × 22 μ. Total length to tip of perithecium 200–300 μ (those on the tips of the legs much smaller, 180–200 μ).

On the legs and abdomen of a small fly. Ralum, New Pomerania. Berlin Museum, No. 1294.

Closely allied to *S. Elachipteræ* and perhaps only a regional variety. The differences in the appendage and in the subbasal cell of the receptacle appear, however, to be constant. The appendage in the present form is unique in possessing but two fertile cells, the lower of which bears three antheridia, the upper two in addition to the terminal one. There are thus six antheridia in all, while in *L. Elachipteræ* there are eight, borne on three superposed cells. The spiniferous cell in this species is terminal and becomes an antheridium.

STIGMATOMYCES ELACHIPTERÆ Thaxter. Plate XLVI, figs. 5–10.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 323. July, 1905.

Receptacle hyaline, the basal and subbasal cells of nearly equal length, the former more or less distinctly inflated distally in the region of a partial septum, above which it may be somewhat faintly marked by transverse lines; the lower portion having its walls thickened from above downward in a characteristically laminate fashion. Stalk-cell of the appendage abruptly distinguished from its much narrower basal cell, which becomes considerably broader distally, a rather large cell being separated from it terminally, bearing three antheridia: above it the appendage consists of two cells, the upper very small, bearing in all normally five antheridia, including the spinose terminal one. Venter of the perithecium pale amber-brown; the wall-cells bulging conspicuously throughout their length, and rather abruptly distinguished above the neck, usually stout and somewhat shorter than the venter; the tip asymmetrical, and slightly oblique, with projecting bluntly pointed apex. Perithecium, venter 55–65 × 30 μ, neck 50 × 16–20 μ. Appendage 80–90 μ, the stalk-cell 15–20 μ. Receptacle about 65 × 18 μ. Spores 40 × 3.5 μ.

On *Elachiptera longula* Loew., Intervale, New Hampshire.

I have had much hesitation in separating this species from *S. constrictus* to which it is too closely allied. In addition to minor points of difference the subbasal cell is rather inflated than constricted and the antheridial appendage differs constantly as indicated in the accompanying figures, in having three cells above the basal cell bearing eight antheridia, the terminal one spinose. The material of this form is abundant and well developed, and was obtained on the legs of its characteristic host, a small fly captured by sweeping over golden rod. The singular layering of the subbasal cell, its partial separation by an inner ridge opposite the nucleus and the transverse furrows of its upper half (fig. 9) are phenomena evidently similar to those seen in *S. constrictus*, and may possibly be connected with a secondary elongation of the basal cell.

STIGMATOMYCES PROBOSCIDEUS Thaxter. Plate XLVI, figs. 11–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 403. March, 1901.

Venter of the perithecium amber-brown, sometimes more than twice as long as broad, usually but slightly inflated, often more so distally; the neck lighter brown, rather abruptly distinguished, relatively very stout, elongate, nearly isodiametric, usually curved throughout; the short tip abruptly somewhat narrower, the apex broad and blunt without well developed elevations. Stalk-cell of the appendage brown, relatively small and short, slightly prominent distally; the basal cell broader than long, the five fertile cells above it rather short and stout, the series curved sidewise, the antheridia lateral in pairs. Spores about 30 × 3 μ. Perithecium: venter 75–95 × 32–36 μ; neck 135–185 × 18–22 μ. Appendage 55–72, μ, stalk-cell 18 μ. Receptacle 110–125 × 29 μ. Total length to tip of perithecium 400 μ.

On the abdomen of a small fly, Ralum, New Pomerania, Berlin Museum, No. 1288.

This species is distinguished by the very long curved nearly isodiametric neck of its perithecium, which is rather abruptly distinguished from the short broad truncate nearly isodiametric tip. The antheridia are not numerous and rather crowded on the appendage, the terminal one spiniferous. Under a high magnification the venter of the perithecium is seen to be finely transverse-punctate.

Stigmatomyces Baeri (Knoch) Peyritsch. Plate XLIX, figs. 22–24.

Since the adult of this species has not as yet been properly figured, I have given two illustrations in the accompanying plates for comparison. The terminal antheridium appears to have arisen from the terminal cell by proliferation, as the latter bears the spine, where its presence has been determined (fig. 22). In older individuals the twist of the wall-cells is even more pronounced than is indicated in fig. 23. The form of the perithecium is somewhat similar to that of *S. dubius*, which is, however, quite different in possessing an eight-celled appendage, and in other respects. I have not yet seen this species in America, but have no doubt that it occurs here.

STIGMATOMYCES SARCOPHAGÆ Thaxter. Plate XLIX, figs. 14–17.
Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 325. July, 1905.

Normally long and slender. Color nearly uniform dull amber-brown, except the hyaline receptacle and the appendage above its basal cell. Venter of perithecium minutely transversely granular-striate, rather narrow, straight, the wall-cells prominent and slightly spiral; the neck rather abruptly distinguished, the cells more or less spirally disposed, a rather distinct subterminal enlargement, above which the subconical tip ends in a blunt slightly oblique apex, the paired posterior lip-cells slightly prominent; the basal cells small, somewhat prominent; the stalk-cell relatively large. The receptacle normally very elongate, hyaline, nearly isodiametric; the subbasal cell much longer than the basal. The appendage long, slender, recurved; its stalk-cell about two or three times as long as broad; the basal cell more than twice as long as broad, the portion above it consisting of five superposed cells, and a terminal antheridium; the total number of antheridia normally nine. Spores about $35 \times 4\ \mu$. Venter of perithecium 75–90 $\times$ 35–42 μ, the neck 150×18–$22\ \mu$. Appendage, to edge of curvature, 110 μ, the stalk-cell about 35 μ, the basal cell 18–20 μ. Receptacle 200–325 $\times$ 30 μ. Total length of larger individuals 600 μ.

In tufts on the abdomen of *Sarcophaga* sp., Island of Margarita, Venezuela; Dr. A. F. Blakeslee.

This large and fine species was obtained in great abundance on a black *Sarcophaga* collected in large numbers by Dr. Blakeslee by sweeping over a mud hole. I was at first inclined to think it identical with *S. Limnophoræ* which is its nearest ally, but the appendages are constantly different and the general characters are sufficiently unlike in the two species, to warrant their separation, although they are undoubtedly closely allied. The position of the spiniferous cell in the mature appendage has not been observed.

STIGMATOMYCES LIMNOPHORÆ Thaxter. Plate XLIX, figs. 11–13.
Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 400. March, 1901.

Venter of the perithecium relatively small, amber-brown, the wall-cells becoming powdered by a darker maculation and separated by a corresponding number of well-defined unmodified longitudinal ridges which run somewhat obliquely and end, not abruptly, at the base of the neck: the latter generally slender, strongly bent throughout or even recurved, abruptly differentiated, sometimes of less diameter than the tip, which is distinguished from the rest of the neck by an abrupt enlargement more prominent anteriorly; the apex (in the not wholly mature types) unmodified, blunt, slightly oblique. Stalk-cell of the appendage rather prominently rounded externally, but not protruding abruptly below the basal cell, which nearly equals it in length and is slender, slightly larger distally, its base hyaline, its wall, which is dark amber-brown above, becoming gradually thicker, so that the lumen of the cell is attenuated below, distally bearing two antheridia; the fertile cells above it, usually seven in number, forming a series outwardly recurved, the terminal cell apparently sterile, the two small cells below it bearing each a single antheridium, while the remainder bear two; the antheridia with short, broad, slightly recurved necks.

Receptacle relatively large, hyaline, the basal cell tapering slightly downward, the subbasal cell slightly longer and much broader distally. Perithecium: venter 55 × 30 μ; neck 75 × 10 μ. Appendage about 75–80 μ, stalk-cell 28 μ. Receptacle 110 × 25 μ. Total length to tip of perithecium 250–275 μ.

On the inferior surface of the abdomen and at the base of the posterior legs of a species of *Limnophorus*. Berkeley, California.

The material on which this species is based was found on two specimens of *Limnophorus* sent from Berkeley with a miscellaneous lot of flies collected by sweeping. Although the perithecia are not quite mature, the characters of the species are sufficiently well defined. *S. Sarcophagæ* being the only form with which it is likely to be confused. The two are most readily distinguished by the appendage which is shorter, with more antheridia, in the present species. It is evidently somewhat proliferous, but I have been unable to determine the position of the spiniferous cell.

Stigmatomyces humilis Thaxter. Plate XLVII, figs. 29–32.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 401. June, 1901.

Venter of the perithecium amber-brown, slightly inflated throughout and slightly asymmetrical; the neck rather abruptly distinguished, concolorous, but paler distally, generally shorter than the venter, stout, tapering to the blunt, hardly differentiated apex; about one third of its length taken up by the tip, which is distinguished from it by a slight broad constriction; the outer basal cells subequal and irregularly prominent. Appendage relatively rather slender, very long, sometimes extending nearly to the middle of the neck of the perithecium, the stalk-cell separated by a slight constriction from the basal cell, which is relatively large, the annular thickening about the base on the inner side of its wall unusually well developed, amber-brown, bearing two antheridia; the subbasal cell almost as large, bearing two antheridia, the two successive cells above it smaller and bearing each a single antheridium; the series completed by a single terminal antheridium; the antheridial necks rather slender, and tapering, somewhat appressed. Receptacle short, stout, the cells subequal. Spores about 28 × 3 μ. Perithecium: venter 46–55 × 32–37 μ; neck 45–47 μ. Appendage 65–75 μ, the stalk-cell 18 μ. Receptacle 55 μ. Total length to tip of perithecium 175 μ.

On the superior surface near the tip of the abdomen of a muscid somewhat larger than the other hosts from Ralum, New Pomerania. Berlin Museum, No. 1287.

This small and somewhat insignificant species is distinguished by its compact habit, the large venter and short neck of its perithecium, and its relatively large and elongate appendage, which may reach to the middle of the perithecial neck. Its terminal antheridium is spinose just below the neck.

Stigmatomyces dubius Thaxter. Plate XLVII, figs. 14–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 402. March, 1901.

Amber-brown with the exception of the receptacle and the stalk-cell of the perithecium. Venter of the perithecium slightly inflated, relatively small, not abruptly differentiated from the broad neck, which gradually enlarges distally below the rather abruptly tapering, slightly bent tip; the middle of the three posterior projections from the lip-cells larger and longer than the others and bent over so as to overlap the anterior lip-cells, which are curved abruptly toward it; the two lateral posterior projections prominent beyond the base of the middle one, rather slender, and slightly curved inward. Stalk-cell of the appendage distally darker, abruptly prominent below the basal cell, which is small, squarish, and deeper brown; the rest of the appendage, which is unusually long, apparently proliferous above the spiniferous cell, extending beyond the venter of the perithecium, is made up of about eight cells, which bear rather long antheridia in pairs, their necks appressed usually in a lateral series. Receptacle relatively large, hyaline, the subbasal cell much longer and broader than the basal cell, which tapers but slightly to the small foot. Spores 30 × 3.5 μ. Perithecium: venter 58 × 40 μ; neck 110 × 25 μ. Appendage 80–95 μ, stalk-cell 25–32 μ. Receptacle 145–185 × 25–30 μ. Total length 350–375 μ.

On a fly with monstrously developed anterior legs resembling those of *Ochtheria mantis*. Ralum, New Pomerania. Berlin Museum, No. 1281 and 1298. On the head and at the base of the posterior legs.

This species is chiefly peculiar for its long flat appressed appendage, the axis of which consists of eight or more cells including the basal cell. The spine arises from the base of the eighth cell where its position has been determined. The neck of the perithecium is relatively stout and has a "bloated" look and is usually not abruptly distinguished from the venter.

Stigmatomyces Limosinæ Thaxter. Plate XLVII, figs. 1–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 406. March, 1901.

Perithecium amber-brown, the venter slightly inflated, the neck not abruptly distinguished, tapering slightly; the tip usually abruptly narrower, the posterior lip-cells forming an inconspicuous irregular truncate or rounded bilobed projection somewhat more prominent than a similar projection formed by the anterior lip-cells; basal cells relatively very large, forming a short, well-defined stalk, hyaline or colored above, often carrying the base of the perithecium beyond the tip of the appendage, and consisting of an inner cell next the appendage and two superposed outer ones, the lower of which (secondary stalk-cell) is smaller; the stalk-cell below these wholly united to the stalk-cell of the appendage, rather stout and short, separated from the cells above it by a horizontal septum, which may be slightly oblique or (as in the California variety) strongly oblique, in which case the secondary stalk-cell extends downward beside the stalk-cell so that only the lower third or quarter of the latter is free externally. Stalk-cell of the appendage relatively large, as long as or often longer than that of the perithecium and about half as broad, usually bulging externally, its outer margin usually curved symmetrically from its base to the base of the basal cell; the latter relatively small, deep amber-brown, half as long as broad, pointed distally between the antheridium which arises from its inner side and the base of the first fertile cell above it, which, with the other fertile cells, are large and prominent, thick walled, much flattened, and obliquely superposed, distinguished by rather deep constrictions, seven to ten in all, or rarely more (seven to fourteen in the Californian form), the original number being increased by the terminal proliferation of the appendage; the antheridia borne on the inner side of the appendage, their very long but not abruptly differentiated necks extending obliquely upward, appressed in a double series; the upper antheridia often infertile, becoming septate and irregularly swollen. Receptacle relatively short, the two cells nearly equal. Spores 28 × 3 μ. Perithecium: venter 50–90 × 40–54 μ; neck 90–125 × 15–18 μ; stalk (basal cells only) 72–100 × 25–35 μ. Appendage 60–100 μ, stalk-cell 30–45 μ. Receptacle 70–75 × 22 μ. Total length to tip of perithecium 250–360 μ. Specimens on legs often much smaller.

On *Limosina fontinalis* Fallen. Kittery Point, Maine; vicinity of Cambridge, Mass.; on *Limosina* sp., Berkeley, California. Usually in a dense tuft on the side or near the tip (inferior) of the abdomen and near the base of the posterior pair of legs.

The Californian material, figs. 3–4, from two specimens of the host, differs constantly from the abundant New England material as noted in the description, as well as from the fact that the venter of the perithecium is longer and less distinctly inflated, while its apex shows no perceptible modification of the lip-cells. The species is remarkable for the repeated proliferation of its appendage, which makes the primarily terminal spinose cell intercalary, the distal cells unlike those of any other species, with the exception of the nearly allied *S. Papuanus*, being usually sterile. The host is a small fly, beset with coarse hairs, and captured by sweeping around muddy ponds or over wet places in woods.

Stigmatomyces Papuanus Thaxter. Plate XLVII, figs. 8–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 407. March, 1901.

Venter of the perithecium dark amber-brown, relatively small and rather prominently inflated, oval to elliptical; usually not abruptly distinguished distally from the hyaline or yellowish neck, which in well-developed specimens is very elongate, tapering very gradually, in others shorter and stouter; the tip clearly distinguished (abruptly so in the shorter forms), subconical, the posterior lip-cells forming a narrow, subtruncate, slightly recurved apical projection beyond the two laterally placed, papillate, slightly divergent projections of the anterior lip-cells; the basal cells forming a short, stout stalk, separated from the stalk-cell by an oblique septum. Appendage relatively small, resembling that of the *S. Limosinæ* in general form, the fertile cells not more than five or six in number, the upper ones separated by constrictions which may be obsolete between the lower ones. Receptacle relatively short, the cells subequal, yellowish. Spores about 20 × 2 μ. Perithecium: venter 50–55 × 40 μ; the neck 90–290 × 20 μ; the stalk 35–45 × 33–36 μ. Appendage, 35–45 μ, the stalk-cell 22–30 × 14–17 μ. Receptacle 55–72 μ. Total length to tip of perithecium 400–485 μ. A few specimens on the legs much smaller.

On three small flies of different species allied to *Limosina*. Ralum, New Pomerania.

This species may prove a regional variety of *S. Limosinæ*, the appendage, though much smaller, and never well developed, being nevertheless of the same peculiar irregularly proliferous type, not seen in any other species. It differs chiefly in the bulbous venter of its perithecium, which passes distally into the enormously developed elongate neck and tip.

ARTHRORHYNCHUS Kolenati.

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XLVIII.

The original name given to this genus in 1857 by Kolenati is here retained in preference to the much later one applied to it by Peyritsch, who redescribed it as *Helminthophana* in 1873; since, however absurd and scientifically worthless the original zoological descriptions of these forms may be, there has never been the slightest question as to the generic identity of the organisms studied by these two authors. Neither the descriptions nor the figures given by Kolenati and Diesing are, however, sufficient to render a specific determination possible, so that the name given by Peyritsch to the European species of the genus, although undoubtedly a synonym of *A. Diesingii* Kol. or of *A. Westrumbii* Kol., or more probably of both, may properly be retained.

The three species herewith illustrated are all characterized by the possession of a highly developed rhizoidal apparatus, which penetrates the soft body-cavity of the host, and arises from a slightly swollen extension of the basal cell. From this intrusion is produced a mass of copiously branching hyaline filaments, which become interlaced in a mass so dense that the course of individual filaments cannot be followed in detail. This condition is barely suggested in Plate XLVIII, fig. 2, in which a few of the branches are approximately indicated.

The genus is undoubtedly very closely related to *Stigmatomyces*, differing in the relative development of the perithecium and receptacle, as well as in its antheridial appendage. The antheridia, although in *A. Cyclopodiæ* they are somewhat unilateral, usually assume a more or less distinctly whorled arrangement on the cells of the appendage, as is well illustrated by the two other species. The modifications of the basal and stalk-cells of these appendages in *A. Cyclopodiæ* and *A. Eucampsipodæ* are very peculiar, and the curious thickenings which are also well marked in the basal cell of the appendage proper of some species of *Stigmatomyces*, are especially noticeable in the first mentioned species. This peculiar structure is perhaps concerned in the partial rotation of the appendage, by which the antheridia become turned away from the perithecium at maturity. As in many species of *Stigmatomyces* the terminal antheridium is armed with a stout spine.

There appears to be but a single ascogenic cell in all three species which is very conspicuous, and peculiar from the fact that, as in *Moschomyces* and a few other genera, it produces the numerous asci which arise from it in several vertical rows, instead of in two, as is more commonly the condition. This is clearly shown in fig. 11, in which a posterior view of the ascus-mass is given, figs. 1 and 7 showing lateral views of similar masses, and their relation to the ascogenic cells.

Dr. P. Speiser, who has made a specialty of the Nycteribidæ, gives a list, in his note on the geographical distribution of the genus *Helminthophana*, of the hosts on which *H. Nycteribiæ* has been observed; but it is evident that at least the three species enumerated below are included in this enumeration. The forms on *Cyclopodia macrura* Speiser are *A. Cyclopodiæ*, the specimens examined by Dr. Speiser and by myself being the same. Those on *Eucampsipoda Hyrtli* Kol. belong to *A. Eucampsipodæ*, one of the specimens here referred to being the same examined by myself in the Berlin Museum. The other hosts mentioned, which are European and may be assumed to have been infested by *A. Nycteribiæ*, at least in some cases, are as follows: *Nycteribia Blasii* Kol., from East Prussia, *N. vexata* Westw., Austria; *Penicillidia conspicua* Speiser, Servia and *P. Dufourii* (Westw), Banat; but it is not impossible that two species may have been confused here. The hosts are all wingless parasites of bats and do not appear to be very commonly infested. I have myself examined the Nycteribidæ in the British Museum and in the Museums at Berlin and Florence, as well as such scanty material as has been available in this country, but, with the exception of the forms referred to seen at Berlin, no parasites were discovered.

ARTHRORHYNCHUS NYCTERIBIÆ (Peyritsch) Thaxter, Plate XLVIII, figs. 7–10.

Thaxter, Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 408, March, 1901.

Although the specimens obtained in the Berlin Museum from species of *Nycteribia* (*N. Frauenfeldii* Kol., No. 922 and *N. Hermani* Leabl., No. 856, both presumably from Europe) do not correspond in all details with the figures given by Peyritsch, especially as regards the conformation of the perithecium, it can hardly be doubted that they belong to the present species, the long free stalk-cell of the appendage being a character which is quite peculiar. The tip of the perithecium is four-lobed, the lobes short and broad, like those of *A. Eucampsipodæ*; but are in turn conspicuously three-lobed. Reference has previously been made under the genus to Dr. Speiser's notes in regard to hosts of this species.

ARTHRORHYNCHUS CYCLOPODIÆ Thaxter. Plate XLVIII, figs. 1–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 407. March, 1901.

Becoming tinged with brownish yellow except the hyaline stalk-cell of the perithecium. Perithecium nearly straight and symmetrical, slightly inflated, usually distinctly constricted in the region of its very small basal cells just above the very large hyaline stalk-cell, which may nearly equal it in length and diameter and is often somewhat enlarged distally: the venter comprising the lower two-thirds, not clearly distinguishable from the neck, which tapers slightly and almost symmetrically, the tip fairly well distinguished above a more or less distinct enlargement, from which it is separated by a slight constriction; the apex consisting of a crown of four nearly symmetrical, distinctly tridentate, erect, or very slightly divergent projections, which are subtended by a corresponding number of slight elevations, the middle lobe of each projection more prominent than the lateral and like them bluntly rounded. Receptacle consisting of two small cells, the lower twice as large as the upper, which gives rise distally to the stalk-cell and bears the free appendage laterally; the foot an unmodified cell which penetrates the host, dividing below into a very copiously branched system of slender, sinuous, rhizoidal hyphæ. Appendage consisting of a dumb-bell-shaped, free stalk-cell, the basal half-rounded or flattened, brownish, somewhat larger than the distal portion, which is deeper brown, flattened and inflated, connected by a narrow hyaline isthmus (the lumen of which may become almost obliterated) with the lower half, and mostly broader than the base of the basal cell of the appendage, which is infertile, subrectangular, or somewhat inflated, slightly longer than broad, the lower half of the walls becoming conspicuously modified by a progressive thickening from above downward, the thickened portion deeper brown; the remaining cells of the appendage three to four in number, brownish, successively smaller from below upward, giving the organ a characteristically tapering habit; the two lowest of these cells usually relatively shorter, and bearing each three to four antheridia side by side, distally and externally; those above relatively longer and narrower and producing fewer antheridia, the terminal one spiniferous. Antheridia with slender curved necks. Spores 60–65 × 4.5 μ. Perithecium: venter 325–350 × 70–90 μ; the stalk-cell 220–250 × 75–80 μ. Appendage, 100–110 μ, the stalk-cell 35–40 × 30–35 μ (the upper half × 28–30 μ). Receptacle 55–75 × 45–50 μ.

On the abdomen of *Cyclopodia macrura* Speiser. New Pomerania. Berlin Museum, No. 854, (Dr. Dahl).

Although Dr. Speiser in his note above referred to, appears to consider this form identical with *A. Nycteribiæ*, there can, I think, be no doubt whatever of its specific distinctness, as a comparison of the accompanying figures will clearly show. The appendage in this species resembles that of *Stigmatomyces* more closely from the somewhat unilateral position of the antheridia; which are fewer in number than in the other species. The host examined was an alcoholic specimen, the Type of Dr. Speiser in the Berlin Museum, and was one of the many interesting forms brought by Dr. Dahl from New Pommerania, near New Guinea. The specimens are mostly broken from the host in removal, yet in a few specimens in which a fragment of the integument adheres, the entering rhizoids are clearly seen forming a dense mass of tortuous branching filaments, which it is quite impossible to follow in detail. The rhizoidal apparatus in this species is more extensively developed than in any other form, not excepting that which is represented in an unbroken condition in the figures of *Ceraiomyces Dahlii* (Plate XLIII, fig. 4).

ARTHRORHYNCHUS EUCAMPSIPODÆ Thaxter. Plate XLVIII, figs. 11–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 109. March, 1902.

Hyaline throughout. Perithecium straight or distally slightly curved, tapering gradually from the middle, or lower, to the broad tip; the apex consisting of a slight median projection surrounded by a crown consisting of four slightly shorter, broad, blunt, distinctly divergent projections, which show indistinct marks of lobing and are symmetrically placed; the stalk-cell about one half as long as the perithecium or less. The basal cell of the appendage constricted in the middle as in the preceding species, the lower half irregularly rounded and four or five times as large as the upper half, which is very small, colorless, and less than half as wide as the cell above it; the fertile cells three in number, the lower bearing four or (?) five antheridia, the upper three in addition to the terminal one, which is furnished with a short hyaline basal spine; the necks of the antheridia large, tapering, divergent. Receptacle as in the preceding species. Spores about 45–50 × 4 μ. Perithecium: venter 250–325 × 65–75 μ; the stalk-cell 110–150 × 55 μ. Appendage, 75–90 μ, the stalk-cell 35 × 25 (the upper half × 10 μ).

On the abdomen of *Eucampsipoda Hyrtli* Kol., Egypt. Berlin Museum, No. 855.

As in the case of the preceding species, Dr. Speiser is inclined to consider this form as identical with *A. Nycteribiæ*, but it seems certainly distinct. It is undoubtedly much more closely allied to *A. Eucampsipodæ*, from which it differs more especially in the details of its appendage. As may be seen by a comparison of figs. 14 and 3, the antheridia of the present form are more numerous and differently disposed, while the conformation at the base of the appendage is quite different in the two cases, the upper lobe of the stalk-cell being very small and not continuous with the base of the appendage proper, as in *A. Cyclopodiæ*. The four lobes at the tip of the perithecium are short and more like those in *A. Nycteribiæ*, but are not three-lobed as in that species.

IDIOMYCES PEYRITSCHII Thaxter. I. p. 302

Additional material of this species has been obtained as follows: Hope Collection, No. 223 on *Deleaster dichrous*, England: and from Scotland on the same host in the Sharp collection: British Museum, No. 393, Europe. On *D. adustus*, Sharp Collection No. 1093, England. I found the peculiar host flying in the evening at Lauterbrunnen, Switzerland, in the village street, and one of the specimens bore a few individuals of this curious form, which seems to be a transitional type between *Stigmatomyces* and the group of genera immediately associated with *Teratomyces*; in which the proliferation and production of appendiculate cells about the base of the perithecial stalk-cells has become much more marked.

SYMPLECTROMYCES nov. gen.

Receptacle consisting of three to four superposed cells, the distal one irregularly proliferous, the proliferations resulting in the formation of numerous appendiculate cells, or short appendiculate branches, which surround more or less completely the bases of the perithecia. Appendages fertile or sterile; the latter simple, cylindrical, sometimes terminated by a beak-like cell: the fertile consisting of numerous superposed cells all of which, except the two or three basal ones and the terminal one, function as antheridial cells, opening by short necks superposed in a single series.

This genus is made for the reception of a single species formerly placed in *Teratomyces*, from which it differs in the character of its appendages, both sterile and fertile; the latter resembling more nearly those of *Corethromyces* by reason of the serial arrangement of its intercalary antheridial cells. The two or three sterile basal cells of this appendage are usually rather definitely distinguished by a slight constriction from the appendiculate cell, and the antheridial cells appear to be formed through successive divisions of a terminal cell which surmounts the series at maturity and is not functional. It is evident that the genus is closely related to *Teratomyces*, between which and *Corethromyces* it seems, on account of the structure of its antheridial appendages, to form a connecting link. The antheridial appendages also recall those of *Stigmatomyces*, but are of a different type, since the successive cells which compose them and are assumed to be antheridial cells, are absolutely intercalary and do not cut off a basal cell.

Symplectromyces vulgaris nov. comb. Plate L, figs. 14–16.

Teratomyces vulgaris Thaxter, l. c., Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 431. April, 1900.

Perithecia one to three in number, usually symmetrical and straight, becoming clear purplish brown, often considerably inflated below and conical above; the tip blunt or sometimes slightly pointed, the basal cells variously elongated sometimes nearly as long as the perithecium proper and often longer than the usually well developed stalk-cell. Receptacle symmetrical, its basal cell nearly hyaline, the cell above it tinged with reddish brown and somewhat larger, the third cell like the subbasal, squarish and somewhat larger. Appendages nearly hyaline or suffused, never deeply, with reddish brown, comparatively few in number, rather stout and long in general, curved beak-like cells sometimes borne on short peripheral appendages; all the appendages, or their primary branches, distinguished by a blackish brown basal septum, some, often many of them distinguished by being closely septate above, the cells thus formed (the antheridia ?) producing a series of lateral outgrowths projecting obliquely upward and superposed. Perithecia 140–200 × 45–60 μ, their basal cells 40–120 μ, the stalk-cell 35–126 × 25 μ. Receptacle to base of appendages 70–100 μ. Appendages (longest) 175 μ. Total length to tip of perithecium 325–450 μ.

On *Quedius fulgidus* Fabr., British Museum, No. 354, Kiel, Germany, Berlin Museum No. 828; Europe, Sharp Collection No. 1096, Spain; on *Q. fuliginosus* Grav., British Museum, No. 355, Europe; on *Q. truncicolus* Fair (= *ventralis* Arag.), British Museum, No. 435, Great Britain; on *Q. cruentus* Oliv., British Museum, No. 422, Europe; on *Quedius* sp. indet., British Museum, No. 356, Canada; on *Q. fulgidus* Fabr., Hope Coll., No. 216, Europe; on *Philonthus*? sp. indet., British Museum, No. 365, Hungary. Berlin Museum No. 830 on *Quedius impressus* Panz., Lusitania, No. 829 on *Q. occultus*, North America, No. 831 on *Quedius* sp., Bengal: Sharp Collection on *Q. dubius* Heer., Albertville, Grande Chatreuse, near Monte Rosa: LeConte Collection on *Quedius peregrinus* Grav., Canada.

It is evident from the hosts and localities above enumerated that this species is widely distributed, although I have never had an opportunity to examine it in a fresh condition and have thus been unable absolutely to observe any discharge from the antheridia. The appendages appear to be very easily broken and are not in good condition in a majority of the specimens examined. A few that are comparatively young possess short peripheral appendages which, as in *Teratomyces*, are terminated by the beak-like cell characteristic of this genus. It is very doubtful if the record on *Philonthus* is reliable.

TERATOMYCES Thaxter. I. p. 354

Several notable additions are made to this well marked type which is a very constant one, as the genus is now restricted by the exclusion of *Symplectromyces vulgaris*. One additional form is known to exist, which was found on a species of *Acylophorus* in the British Museum, No. 394, from Tasmania, and is easily distinguished by its slender form and translucent receptacle, the basal cell of which is very small and conspicuously suffused. The material was however too immature for description.

Of the species previously illustrated *T. Actobii* has been found in the British Museum on *Actobius cinerascens* Gr., from Merton, England, No. 438: *T. mirificus* has also been again observed on a species of *Acylophorus* from Lake Eustis, Florida.

TERATOMYCES PHILONTHI Thaxter. Plate XLIX, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 432. April, 1900.

Perithecia commonly two, long and slender, a basal middle and distal portion distinguished, corresponding to the basal, middle and the distal wall- and lip-cells, the basal portion slightly inflated, purplish, the middle distinguished from it by a slight elevation at the septa; the middle nearly hyaline, rather abruptly narrowed, its margin slightly concave owing to a slight distal enlargement, which, in mature specimens, distinguishes it rather abruptly from the much shorter narrower subconical mostly symmetrically truncate colorless distal portion; the stalk-cell rather short, concealed by the appendages; the basal cells forming a squarish base. Receptacle relatively small, symmetrical or asymmetrical, the basal cell translucent brownish, the subbasal cell very small, flattish, wholly involved by the deep nearly opaque suffusion of the lower half or more of the upper cell, which is nearly hyaline above. Appendages short, slightly exceeding the base of the perithecium, rather rigid, slightly divergent, for the most part dark brown; forming a rather dense tuft, many ending in pointed cells, the slender terminations straight or bent and forming the beak-like cells characteristic of the genus. Spores 36 × 4 μ. Perithecia 140–175 × 25–30 μ, the stalk-cell about 35 μ. Receptacle about 85 × 35 μ. Appendages (longest) about 70 μ. Total length to tip of perithecium 250–300 μ.

On *Philonthus* sp. indet., British Museum, No. 365, Hungary.

A species well distinguished by the successive ridges on the perithecium and short dense appendages. It appears to be rare as I have met with it only once among the many hundreds of *Philonthi* examined. It is possible that the generic determination of the host may not be correct.

TERATOMYCES ZEALANDICA Thaxter. Plate XLIX, figs. 1–3.

Receptacle with a distinct distal obliquity, opaque with the exception of a hyaline area just above the foot, the margins straight, the distal portion relatively narrow, the base relatively broad, the suffusion involving the bases of the appendiculate cells which are relatively numerous and narrow and more or less suffused with brownish yellow. Appendages sometimes scanty, but slightly divergent, concolorous throughout, nearly hyaline or pale yellowish; the basal cells of the larger branches relatively slender, the external branchlets and numerous beak-like cells hardly more deeply colored. Perithecia relatively large, long, rather slender, slightly inflated throughout, the blunt tip more or less abruptly distinguished; the stalk-cell very short or almost obsolete, hidden by the appendages; the basal cells relatively small and not distinguished from the body of the perithecium. Spores about 50 × 2.5–3 μ. Perithecia 150–180 ×20–28 μ, basal and stalk-cells together about 35 μ. Longest appendage 180 μ. Receptacle 75–125 × 15–18 (base) 22–30 μ (distally).

On *Quedius insolitus* Sharp. Dunedin, New Zealand. Sharp Collection, No. 1099.

This species is well distinguished by its nearly isodiametric receptacle, as well as by its appendages, which are either wholly hyaline, or evenly and only slightly suffused; while the dark ring which separates the stalk-cell of the perithecium from the receptacle (fig. 1) is at least not visible in other species.

TERATOMYCES PETIOLATUS Thaxter. Plate XLIX, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 35. June, 1901.

Receptacle nearly symmetrical, almost wholly black, slender below, expanding rather abruptly distally; the appendiculate cells relatively large and long, translucent, brownish yellow, subtended by a slight enlargement. Appendages numerous, spreading, the larger ones consisting of a very large colorless or brownish basal cell, which bears a series of branchlets externally and several branches terminally; the branchlets usually short, and two-celled, the distal cell usually long, beak-like and clear purplish brown, the lower cell hyaline or light brown and in the lower branchlets usually bearing long-necked antheridia: the terminal branches with several short branchlets of a similar character. The smaller shorter appendages about the bases of the larger ones, mostly dark purplish brown, with many beak-like cells. Perithecia usually several, large, symmetrical, purplish brown; the tip short, rather narrow and abruptly distinguished; the basal cells relatively very large, forming a portion of the stalk sometimes half as long as the perithecium proper; the stalk-cell stout and elongate. Perithecia 185–225 × 45–50 μ, the basal cell 100–150 × 10 μ, the stalk-cells 180–300 μ. Receptacle about 150 μ. Appendage, longest 175, longest basal cells 110 μ.

On *Quedius* sp. Greymouth, New Zealand, Sharp Collection, No. 1103.

This species, which is nearly allied to *T. insignis,* differs in its shorter and abundantly branched appendages, as well as in the characters of its perithecia, the basal cells of which are very large and not related as in the last mentioned species.

TERATOMYCES INSIGNIS Thaxter. Plate L, figs. 12–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 36. June, 1901.

Receptacle usually quite opaque, long, slender; the outline unbroken and nearly straight, tapering evenly to the slightly geniculate base, which is nearly hyaline just above the foot: the margin of the suffused area distally strongly oblique, especially before maturity; the appendiculate cells small, becoming brownish. The appendages numerous, spreading, the larger ones hyaline or nearly so, consisting of a large elongate basal cell, which bears two or three small remote antheridial branches externally; and terminally, as a rule, two large branches placed side by side (one of which may be wanting) sometimes associated with one or two subterminal smaller branchlets, the basal cells of which are dark contrasting brown: the terminal branches hyaline with branchlets like those of the basal cell; the branchlets, however, more numerous, contrasting, brown, simple or branched, many having characteristic beak-like terminations, while others are blunt tipped, with oblique septa. The smaller peripheral appendages more or less crowded around the bases of the larger ones, with conspicuous and numerous beak-like terminations. The antheridia with long curved necks. Perithecia usually several, brown, long and slender, straight, very slightly inflated near the base, with a slight submedian enlargement; tapering throughout to the short, truncate, well distinguished tip: the basal cells rather small, concolorous; the group narrower than the stalk-cell and separated from it by a horizontal septum: the stalk-cell very large, usually elongate, often inflated and thick walled. Spores about 50 × 4 μ. Perithecia including basal cells 240–275 × 40 μ, the stalk-cell 150–325 × 25–35 μ. Appendages, longest 225 μ. Receptacle 100–185 × 14 (base) × 55 (distal end). Total length to tip of perithecium largest, 800 μ.

On abdomen of *Quedius* nov. sp., New Zealand. Sharp Collection, No. 1159.

The accompanying figures represent what appear to be variations of this species, fig. 12 being taken as the Type, both obtained from the same individual. Although they differ as to the suffusion of the receptacle, and to some extent as to the appendages, I am inclined to consider them the same, the differences, being perhaps due partly to difference in age or position of growth.

RHADINOMYCES Thaxter. I. p. 305.

I have called attention in my Monograph to the close relation between this genus and *Corethromyces,* but though I have been often tempted to unite them, I feel that until the species are more thoroughly known they are best kept separate. The present genus normally produces one or more secondary perithecia, while this is an exceptional occurrence in *Corethromyces,* and these secondary perithecia always arise from the subbasal cell like the primary one. In *Corethromyces,* on the other hand, when a secondary perithecium occurs it is always developed from the basal cell of the appendage; and while this basal cell is never appendiculate in this genus, it is normally so in *Rhadinomyces.* There are also certain differences in the antheridial branchlets which may be significant. Several allied forms are represented in my South American material which has not yet been studied and it may be hoped that an examination of these new forms may make a more definite conclusion possible.

Of the species of *Rhadinomyces* first described, I have found *R. pallidus* in its typical form in the British Museum, No. 441 on *Lathrobium angustatum* from Folkestone, England, No. 444; on *L. quadratum* from Notting Hill, England; and also in the Hope Collection No. 226 on *Lathrobium* sp. from England. A third species, possibly a variety of *R. cristatus,* has been found on several *Lathrobia* in America, and was illustrated in my Monograph, Plate IX, fig. 10, as "Var. a." The same form, or one closely allied, was obtained in the British Museum, No. 445, on *L. terminatum* Gr., from Eltham, and in the Sharp Collection, No. 1144, on *L. brunneipennis* from Thornhill, England. It is necessary, however, to examine more abundant and better material of this variety before its limits can be determined.

CORETHROMYCES Thaxter. I. p. 303

Two typical species are added to this genus which correspond in all respects to the original type, and also two peculiar forms on *Stilicus* which depart distinctly from this type. The relations of their antheridia, however, appear to correspond to the type as may be seen in fig. 9, plate L, and their reference here appears to be correct.

Corethromyces Cryptobii Thaxter. Plate LI, fig. 3.

This species appears to vary considerably in size, the accompanying figure representing its extreme development. The individual illustrated was associated on the same host with much smaller ones in which the appendages form a shorter denser tuft; but in all cases there seem to be three main erect branches of the appendage which, in connection with other details of structure, serve to distinguish it from the allied *C. Braziliensis.* The figure is drawn from material found on specimens of *Cryptobium* kindly sent me from Kansas by Professor M. A. Barber.

Corethromyces Brazilianus Thaxter. Plate LI, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 432. June, 1901.

Perithecium and receptacle much as in *C. Cryptobii,* but differing distinctly in the character of its appendage, the inner main branch of which consists of from four to six cells, the others very short, all nearly opaque, the branchlets long rigid divergent, curved abruptly outward at the tips. Total length to tip of perithecium 200–375 μ. Spores 28 × 3 μ. Perithecia 90–175 × 28–38 μ. Appendages to tip of branchlets 140–200 μ. Two specimens from Colombia, apparently identical, are much larger; total length 610 μ; branches of appendages 540 μ; perithecia 450 μ.

On *Cryptobium Brazilianum* Luc., Paris Museum, No. 173, (Type) Brazil; on *C. fasciatum* Erichs, Paris Museum, No. 197, Caracas, Venezuela; on *C. Flohri* Sharp, British Museum (Biologia Coll.), No. 762, City of Mexico; also from same collection on *C. venustum* Sharp, No. 758, Oaxaca, Mexico; on *C. similipenne* Say, No. 761, Mexico. The larger type on *Cryptobium* sp. indet., British Museum, No. 385, Colombia. On all parts of host.

This species seems clearly distinguished from *C. Cryptobii* in that its appendage produces only an inner main branch, the rigid branchlets from which, together with the tuft of short external branches from the main appendage, are bent outward in a characteristic fashion quite unlike that in *C. Cryptobii.* The very large specimens (British Museum No. 385) from Columbia do not appear to differ essentially from the typical form, and similar variations in size are common in *C. Cryptobii.*

Corethromyces purpurascens Thaxter. Plate L, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 433. April, 1900.

Perithecia dull purple, mostly slender straight or slightly curved, nearly isodiametric or the outer margin convex; the base slightly broader, the junction of the basal and subbasal, and of the subbasal and subterminal wall-cells indicated by a distinct protrusion in well developed individuals, in which the tip is thus moderately well distinguished; although in most cases, especially in smaller specimens, the margin forms an unbroken line from base to apex, the perithecium being sometimes distinctly inflated basally; the stalk-cell as in *C. Cryptobii*, hyaline above, becoming opaque brown below. Basal cell of the receptacle purplish or brownish translucent, the rest opaque indistinguishable from the almost wholly opaque main body of the appendage, the oblique inner margin of which is followed by a series of hyaline or purplish cells, three or more in number which give rise to the erect branches; the primary branches sometimes purplish near the base but producing an erect tuft of branches and branchlets which are quite hyaline, more or less flexuous and tapering. Perithecia 100–150 × 25 μ. Total length to tip of perithecium 175–275 μ. Longest branches of appendages about 140 μ.

On *Cryptobium capitatum*, Paris Museum, No. 172, Brazil; on *Cryptobium* sp. indet., British Museum, No. 494, Balthazar, Grenada, West Indies.

Although distinguished from the allied *C. Cryptobii* by no very striking characters, this species can hardly be confused with it on account of its purplish color and hyaline appendages, which are suffused only about the base.

CORETHROMYCES STILICI Thaxter. Plate L, figs. 6–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 42. June, 1901.

Perithecium amber-colored, with a faint brownish or reddish tinge, somewhat irregular in outline through a spiral twist in the wall-cells, which are distinguished from one another by slight furrows; slightly inflated toward the base, tapering to the broad blunt apex; the tip not at all distinguished; the basal and stalk-cells well developed, hyaline, the latter bent abruptly upward from its insertion. Basal cell of the receptacle small, hyaline on the anterior side just above the foot, but otherwise blackish brown or opaque, bulging posteriorly above the foot; distally and posteriorly proliferous to form a straight, black, blunt finger-like outgrowth, which lies external to the appendage; the subbasal cell nearly hyaline, subtriangular, separated from the basal cell by a very oblique septum. Appendage hyaline, consisting of a nearly free and nearly isodiametric stalk-cell, above which are three or four cells which produce a close tuft of hyaline branches on the inner side. Spores about 30 × 3 μ. Perithecia 80–85 × 22 μ, its stalk-cell 30 × 18 μ. Receptacle 25 μ, the outgrowth 55 × 7 μ. Appendage, including branches, 50 μ. Total length to tip of perithecium 150 μ.

On the abdomen of *Stilicus* sp., Interlaken, Switzerland. On *Stilicus rufipes Germ.*, Berlin Museum, No. 836. Europe. On *S. angularis* Lec., Arlington, Mass.

The American specimens of this species appear to be identical with the European material. It is principally peculiar for the blackened proliferation of the basal cell, which is somewhat variably developed in different individuals. It is a small form not readily seen as it grows more or less appressed on the black abdomen of its host, an ant-like staphilinid common in dry brush piles.

CORETHROMYCES LONGICAULIS Thaxter. Plate L, figs. 10–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 21. June, 1902.

Receptacle abnormally developed, very small, the basal and subbasal cells arising almost side by side immediately above the foot; the basal cell long and narrow, strongly curved so as to become concave externally, its wall very thick, the cavity becoming almost obliterated; the distal half nearly horizontal, slightly bulging and becoming wholly deep black-brown, except along its upper (in position) margin which is transparent yellowish and closely applied to the lower surface of the basal cell of the appendage, beyond which it hardly projects externally and which thus appears to arise from it; the subbasal cell larger, nearly hyaline externally, convex, bulging below, with a more or less distinct constriction below its slightly enlarged upper portion, which gives rise distally to the broad stalk-cell of the perithecium and sublaterally to that of the appendage. The appendage much reduced, nearly hyaline, consisting of three superposed cells; the basal (stalk-cell) squarish or rounded, the lower half or less of its inner margin connected with the subbasal cell of the receptacle, its subbasal cell smaller, bearing usually a single short antheridial branchlet; the upper cell still smaller, often hardly distinguishable, bearing one or two short antheridial branchlets and a short sterile terminal branch. Antheridia terminal, one to three in a series. Stalk-cell of the perithecium relatively very large, often curved, usually as large as all the other parts of the plant combined, brown, slightly constricted at its insertion, nearly cylindrical, slightly and gradually broader toward and below the basal cells, which are relatively small and barely separate the cavity of the perithecium from that of the stalk-cell; body of the perithecium concolorous with the stalk-cell, slightly inflated, tapering distally almost symmetrically to the blunt tip, which is somewhat asymmetrical from the slightly greater prominence of one of the lip-cells; the series of wall-cells strongly spiral, completing as a rule somewhat more than one whole turn. Spores 30 × 3 μ. Perithecia 65 × 20 μ, the stalk-cell 90–110 × 12 μ. Receptacle 25 μ. Appendage 30–40 μ. Total length to tip of perithecium, average 200 μ.

On *Stilicus angularis* Lec., at the base of the head on the upper side; Arlington, Mass., June.

This species was found in the same locality and on the same hosts that yielded *C. Stilici*, and *Stichomyces Stilicolus*, and is remarkable for the great reduction of its receptacle and appendage, the hypertrophy of its perithecial stalk-cell, and the close spiral twist of its perithecial wall-cells, which is more marked here than in any other species of the family. The species is most nearly allied to *C. Stilici*, but seems constantly different in the characters above noted.

EUCORETHROMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 433. April, 1900.

Receptacle consisting of two superposed cells, the upper giving rise to the stalked perithecium and the appendage. Appendage consisting of two superposed cells, the distal one bearing terminally a series of branches which produce directly free, flask-shaped, sessile antheridial cells borne laterally, singly or in groups.

The type of this genus resembles *Rhadinomyces* very closely in general appearance, but differs in the origin and arrangement of its antheridia which are never intercalary, arising, as is indicated in fig. 6, Plate LI, quite independently of one another.

Eucorethromyces Apotomi Thaxter. Plate LI, figs. 4–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV. p. 433. April, 1900.

Hyaline becoming tinged, especially the perithecium, with pale amber-brown. Receptacle short, the subbasal cell usually smaller, its axis coincident with that of the stalk-cell. Perithecium rather slender, inflated toward the base, the distal half slender tapering slightly to the blunt unmodified apex, the basal cells rather small, nearly equal, the stalk-cell stout and well developed. Appendage divergent almost at right angles to the axis of the receptacle, its basal cell usually more than twice as large as the subbasal cell, which bears distally and anteroposteriorly a single, or partly double, row of from four to six branches, some of them often elongate, slender straight or curved, suffused with dark blackish brown, hyaline along the inner margin at least toward the base, obliquely septate, the septa dark; the antheridia, stout, flask shaped, subtended by a dark septum, borne singly and laterally, or several together, on short branchlets near the base of the branches. Spores 26 × 2 μ. Perithecia 100–125 × 25–28 μ, 35–38 × 14–18 μ. Receptacle 40 × 18 μ. Appendage without branches 50 × 16 μ. Total length to tip of perithecium 190–207 μ. The Celebes material somewhat smaller.

On elytra of *Apotomus xanthotelus* Bates, British Museum, No. 578, Celebes; on *A. rufus* Rossi, British Museum, No. 577, Europe.

Although the East Indian material of this pretty species is somewhat immature, it appears to differ in no essential respect from the European specimens. The appendage represented in fig. 6 is drawn from the Celebes material, while figs. 4 and 5 are from *A. rufus* and are taken as the type forms. The host is a minute carabid beetle of singular appearance.

STICHOMYCES Thaxter.

LI 7-14

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 37. June, 1901.

Receptacle consisting of two cells, the upper bearing one or more perithecia laterally, and an antheridial appendage terminally. The appendage consisting of several superposed cells, the lowest normally sterile, those above it bearing opposite lateral branches distally, the series ending in a terminal sterile branch. Antheridia simple flask-shaped, free, borne in small groups on short branchlets.

The two species included under this name are so unlike, that the inclusion of *S. Stilicolus* must be regarded as only provisional. It is therefore somewhat difficult to define the limits of the genus with great exactness. In *S. Conosomæ* the perithecia are often several in number, budding from the subbasal cell of the receptacle or from the usually sterile cell above it, which normally forms the base of the appendage. The main axis thus becomes a series of superposed cells which, except the basal ones, separate by an oblique septum distally, on one or both sides, perithecia, in the case of the two lower cells, and antheridial branches in the others; the series ending in a long terminal "appendage." An examination of more species is needed to indicate the limitations of the genus and its immediate relationships. Among the other genera it approaches *Rhizomyces* in the character of its appendage, but the resemblance is otherwise slight.

Stichomyces Conosomæ Thaxter. Plate LI, Figs. 7–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 38. June. 1901.

Dull amber-brown. Receptacle and appendage undifferentiated, the basal cell of the former small, triangular in outline; the subbasal cell about as broad as long, and similar to the cells of the appendage, bearing distally and laterally a single perithecium, sometimes two, which are then paired on opposite sides of the cell, like the antheridial branchlets. Appendage consisting of five superposed subequal cells slightly longer than broad, the basal one sterile, or not infrequently producing one or two perithecia as in the subbasal cell below it: the three cells above slightly larger, the upper angles separated by oblique septa to form small cells on either side, which bear short one- or few-celled antheridial branchlets; the terminal cell somewhat smaller, bearing a simple terminal several-celled branch in addition to the lateral branchlets, all of which usually appear to be sterile. Antheridia with broad necks grouped in twos or threes. Perithecium darker brown, more or less symmetrically inflated; the tip hardly modified; the basal cells collectively broader and nearly as long as the stalk-cell. Spores 35 × 2.5 μ. Perithecia 85 × 25 μ, the stalk-cell 36 × 14 μ. Total length to tip of the appendage proper 150 μ, the terminal branch 150 μ, the antheridial branchlets about 20 μ. Total length to tip of perithecium 185–200 μ.

On *Conosoma pubescens* Payk. Belmont and Waverley, Mass. First observed by Mr. Bullard. Kittery Point, Maine.

This species is not uncommon on its active host, sometimes in company with *Smeringomyces*; but is usually found in rather poor condition; the terminal portion becoming easily broken, or injured, so that an abnormal production of branchlets takes place. It occurs on all parts of the host, but especially on the elytra.

Stichomyces Stilicolus Thaxter. Plate LI, figs. 11–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 24. June, 1902.

Hyaline, becoming tinged with yellowish, the perithecia becoming pale amber-brown. Subbasal cell of the receptacle about twice as long as the basal cell; the stalk-cell of the perithecium and that of the appendage symmetrically divergent, or the former lateral in position. The appendage consisting of a free, relatively long, distally somewhat enlarged basal cell, and two to four much smaller distal cells; the lower of which give rise from their upper angles to short branches bearing free antheridia, usually in pairs; the distal cells producing sterile branches which are more or less elongate, hyaline, and sparingly branched. Stalk-cell of the perithecium very large and stout, inflated or distally enlarged below the rather inconspicuous basal cells; body of the perithecium relatively small, becoming amber-brown, curved strongly inward, tapering slightly to the blunt unmodified tip. Spores 35 × 3 μ. Perithecia 60–90 × 18–28 μ, the stalk 90–100 × 20 μ. Receptacle 30–40 × 18 μ. Appendages 150–200 μ.

On the thorax, prothorax and adjacent legs of *Stilicus angularis* Lec., on the right side; Arlington, Mass., June.

Although very different from the type of *Stichomyces* this species seems provisionally referable to no other genus. It has been found only once in company with *Corethromyces* near the pond in the Arlington Park, where its host occurred in great abundance concealed in piles of dry melon stems. It may be mentioned that what appears to be the same species as well as certain others nearly allied, were found by me on species of *Stilicus* near Buenos Aires; but these forms have not as yet been carefully examined. In habit it resembles *Rhadinomyces*, but differs in having free antheridia. As above mentioned the generic reference must be regarded as merely provisional.

RHIZOMYCES Thaxter. I. p. 307

The two additional species of this genus herewith illustrated indicate that, although its appendage-characters are well defined, the presence of a penetrating rhizoid, which occurs in the type and suggested the generic name, is not of generic value; since in *R. ctenophorus* the plant is attached by the usual foot. The same condition is seen in *Dimeromyces* and in *Ceraiomyces*, which further illustrate the unimportant nature of the rhizoidal character. The species thus far observed all occur on the very peculiar flies belonging to the Diopsidæ, all of which are characterized by the possession of stalked eyes. It is uncertain, however, whether all the infested specimens belong to the genus *Diopsis*, since these insects are largely undetermined in the collections examined.

Rhizomyces ctenophorus Thaxter.

Further material of this species was found in the Berlin Museum on African species of *Diopsis*; No. 852 from Usambara; No. 861 from Zanzibar, and No. 853 from Wangunga. Although the species varies considerably in the length of its perithecial stalk-cell, and in the development of its appendage which may be much shorter than in the specimen illustrated in my figure, the characters seem otherwise quite constant.

Rhizomyces gibbosus Thaxter. Plate LII, figs. 22–23.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 409. March, 1901.

General habit more or less sigmoid. Perithecium amber-brown, concolorous, with its relatively large basal cells, from which it is hardly distinguished, asymmetrically inflated, bent, and tapering somewhat distally; a subterminal abruptly rounded enlargement, beyond which the short asymmetrical tip is clearly distinguished, bearing a large two-celled outgrowth posteriorly, the lip-cells being otherwise unmodified: stalk-cell hyaline, variably, sometimes greatly elongated, separated from the basal cells by a more or less distinct constriction. Appendage nearly hyaline, except the small deep brown sterile basal cell, the remaining cells, three to seven in number, bearing short one- to two-celled branches distally and laterally on which the free flask-shaped antheridia are borne singly or several together. Receptacle short and stout, the upper cell several times as large as the basal cell, which appears to penetrate the host directly by means of a rhizoidal apparatus. Spores about 35 × 3 μ. Perithecium, including basal cells, 85–108 × 30–36 μ; the stalk 60–160 × 18–20 μ. Appendage 65–110 μ. Total length to tip of perithecium 180–325 μ.

On the upper surface near the tip of the abdomen of a species of *Diopsis*. Berlin Museum, No. 850. Tanga, Africa.

This species is well distinguished from the allied *R. ctenophorus* by the peculiar conformation of its perithecium, and by its comparatively simple appendage. That it possesses penetrating rhizoids is evident from an examination of the types, but in all cases they were broken in removal.

RHIZOMYCES CRISPATUS Thaxter. Plate LII, figs. 19–21.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 434. April, 1900.

Perithecia brownish, dimorphous either (a) with the inner margin strongly convex, the outer nearly straight or concave owing to a general outward curvature, tapering to the undifferentiated tip, the apex broad truncate usually symmetrically bisulcate or (b), the type, straight symmetrical abruptly enlarged below the narrow abruptly distinguished tip: the basal cells well defined nearly isodiametric, the stalk-cell large, as long or longer than the perithecium. Receptacle two-celled, the foot typically modified and blackened, without rhizoids, distally geniculate through a protrusion of the distal cell below the insertion of the stalk-cell and opposite that of the appendage. Appendage erect, sometimes exceeding the tip of the perithecium, consisting of a single series of superposed cells, the three or four lower suffused with smoky brown, the rest subhyaline, each cell except the basal one giving rise directly and externally to a branch, the insertion in successive cells being somewhat to the right and left of the median line so as to form two vertical rows, the basal cells of alternate branches being superposed; each branch consisting of a basal cell externally blackened, which gives rise above to a one-celled short branchlet, bearing usually a pair of long, slender antheridia, the remainder of the branch curved upward blackish brown except its upper margin, and giving rise from its lower (external) side to a series of close-set simple branchlets, black, recurved, more abruptly at the tips which are slightly enlarged and nearly hyaline, the whole suggesting the margin of a curled black feather. Spores 20 × 2.8 μ. Perithecia 65–75 × 27–30 μ, the stalk-cell 50–85 μ. Receptacle 30 μ. Appendages 140–175 μ.

On *Diopsis* sp., Brit. Mus., No. 739, Natal: Berlin Museum No. 850, Tanga; No. 859, Johan Albrechtshohl, N. Kamerun; No. 851, Usambara; No. 858, Bismarkberg, Togo. All African.

This species is one of the most striking members of the family from the peculiar ostrich-plume habit of its appendages. There appear to be two distinct types of form in the perithecia even among individuals occurring together on the same specimen of the host-insect, as is indicated in the accompanying plate. In the straight form the enlargement below the tip is more or less striking, and specimens occur in which, as in fig. 20, the enlargement is double. These differences were at first thought to be due to differences in the point of view, but an examination of sufficient material would seem to show that such is not the case. Although it is barely possible that these forms may be distinct, there appear to be no other differences. The penetrating rhizoid which characterizes the other species is absent in the present instance, and is replaced by the normal foot.

SPHALEROMYCES Thaxter. I. p. 365

This genus proves to be well represented on hosts belonging to the Staphylinidæ and though of a single type, the species are often well distinguished, especially by their perithecial characters. In a few cases it has been difficult to determine whether forms should be referred here or to *Corethromyces*, the general characters being superficially similar in the two genera. The seriate antheridia of *Corethromyces* serve to distinguish it at once, when the material is sufficiently good to show these structures, although even in this respect, simple species of the last mentioned genus, like *C. Stilici* in which the antheridia may be even solitary or serially grouped in small numbers, are not always easily placed. Owing to the fact that the appendages are easily broken, the presence of antheridia has been actually observed in but few instances, and the general structure has of necessity been used in referring many of the species to this genus.

SPHALEROMYCES LATHROBII Thaxter.

Specimens corresponding in all respects to the type of this species were found in the Hope Collection on a specimen of *Lathrobium quadratum* Puyk., labeled "Puyk Gyll." Whether this is a locality, and if so where it is, I am unable to say. The host is a European species.

SPHALEROMYCES INDICUS Thaxter. Plate LII, figs. 17–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 41. June, 1901.

Perithecium relatively very long and large, yellowish, very slightly inflated toward the base, tapering very gradually to the broad, blunt tip which is subtended by a truncate, conical lateral projection; the stalk-cell relatively short. Receptacle relatively small, the two cells nearly equal, the upper bearing the stalk-cell of the perithecium terminally and the basal cell of the appendage laterally; the latter overlapping it to its base. Appendage consisting of four superposed cells, the basal (stalk-cell) small, triangular; the two cells above it larger and longer, bearing short antheridial branches from the upper inner angles; the terminal cell smaller, subconical, bearing a small terminal branchlet. Spores about 44 × 4 μ. Perithecium 290–340 × 45 μ, the stalk-cell 72 μ. Receptacle 55 μ. The appendage 125 μ.

On the upper surface of the tip of the abdomen of *Pinophilus* (near "*P. rufipennis*"). Malabar, India. Sharp Collection, No. 1151. British Museum, Burmah India, No. 390.

A species most nearly related to *S. occidentalis*, which occurs on *Pinophilus* in Utah but is small and differently shaped, and lacks the characteristic subterminal projection of the perithecium peculiar to the present species. The material is, for the most part, in bad condition, the branchlets of the antheridial appendages being mostly broken, but its essential characters are shown with sufficient clearness.

SPHALEROMYCES ATROPURPUREUS Thaxter. Plate LII, figs. 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 441. April, 1900.

Perithecium large, purplish, more or less distinctly curved away from the appendages, tapering below, often broader distally above the middle, tapering thence slightly to the tip, which is usually not distinctly differentiated; the apex small truncate or slightly papillate; the basal cells large, as long as or longer than the stalk-cell, dull amber-brown. Basal cell of receptacle large, not greatly elongated, tapering below, the nearly hyaline distal portion, obliquely distinguished from the deeply suffused, partly opaque portion of the cell below; the subbasal cell subtriangular. Appendage consisting of about five cells decreasing in size from below upward, the septa nearly horizontal; those above the basal cell giving rise to a branch on the inner side, which in the subbasal cell and the cell above it consist of a very large broad basal cell, from which arise from two to four subhyaline branches which may be once branched, the branches crossing the stalk and basal cells of the perithecium obliquely, usually on the left side, so that when the perithecium lies at the left, the appendages lie above them. Spores 35 × 3.5 μ. Perithecia 175–200 × 30–35 μ, the stalk and basal cells together 50–70 × 17–20 μ. Receptacle 85–100 × 40 μ. Total length to tip of perithecium 270–350 μ. Appendage without branches 50–75 μ.

On abdomen of *Quedius graciliventris* Sharp, British Museum, No. 740 (Biologia Coll.), Volcan de Chiriqui, Panama; on *Q. basiventris* Sharp, No. 741, from same locality.

This species is distinguished from other forms possessing a blackened basal cell, by the small unmodified tip of its relatively very large perithecium. It is perhaps most nearly allied to *S. Brachyderi*, but lacks the perithecial appendage of this species.

SPHALEROMYCES BRACHYDERI Thaxter. Plate LII, figs. 3–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 442. April, 1900.

Perithecium evenly suffused with brown, paler distally, somewhat inflated at the base, tapering slightly toward the tip; an external deep brown almost opaque appendage projects subterminally, exceeding the tip of the perithecium, broad with a nearly median indentation of the inner side, the outer margin slightly, the upper strongly curved outward, terminating in a short blunt point or slightly inflated portion rather abruptly distinguished on its inner side; the tip asymmetrical, one of the outer lip-cells extending above and free from the others, forming a hyaline bluntly pointed termination at the base of which the tips of the other lip-cells form irregular prominences which may be slight, or obsolete; basal cells concolorous, stalk-cell short and similar to the basal cells. Basal cell of the receptacle very large, long, attenuated below and deeply blackened, as in *Camptomycès*, the distal cell subtriangular concolorous with the stalk-cell. Appendage consisting of four or five rather flattish brown cells, decreasing in size from below upward, their septa directed obliquely outward and downward, each producing a branch from its upper inner angle, which is simple or one or more times branched, the branchlets subhyaline. Spores about 30 × 3 μ. Perithecia 120–140 × 28–35 μ, its appendage 35 × 12 μ. Receptacle 85–100 × 30–35 μ. Primary appendage about 35 μ, with branchlets about 120 μ. Total length to tip of perithecium 225–260 μ.

On tip of abdomen of *Brachyderus antennatus* Sharp, in Dr. Sharp's Coll., Ega, Amazon, No. 1155.

This species is similar in general to *S. atropurpureus* which, however, lacks the perithecial appendage. It varies considerably in size, but the characters appear otherwise constant.

SPHALEROMYCES CHIRIQUENSIS Thaxter. Plate LII, figs. 1–2.

Proc. Am. Acad. Arts and Sci., XXXVII, p. 40. June, 1901.

Almost uniformly translucent dirty amber-brown. Perithecium very large and crowded with spores, long, with a very slight general inflation, the base narrower, tapering abruptly at the short tip: one of the lip-cells forming an erect, median, straight, hyaline, cylindrical or slightly inflated, nearly truncate terminal projection, which is subtended by a posterior or partly lateral, somewhat larger, spine-like, slightly divergent, deep black brown, nearly straight or slightly outcurved pointed outgrowth, its tip nearly on a level with that of the median projection: the basal cells collectively slightly larger than the short stalk-cell, and not distinguished from the base of the perithecium. Basal cell of the receptacle very large, tapering throughout from the broad distal to the narrow basal end, paler than the small, flattened, deeper brown subbasal cell. The appendage consisting of a relatively large basal stalk-cell, which is slightly longer than broad, and partly united to the stalk-cell of the perithecium; above are four short successively smaller cells, their septa slightly oblique, the three lower bearing branches as usual, which may branch once above their basal cells, the branchlets brown, erect, rigid, closely aggregated; the uppermost cell paler, with a terminal branch. Spores 50 × 2 μ. Perithecia 220–250 × 40–48 μ, to tip of median projection, the subterminal process 25 × 7 μ; the stalk-cell 35 × 25 μ. Receptacle 240 × 40 μ, the basal cell 220 μ. Total length to tip of perithecium 500–600 μ. Appendage without branches, including stalk-cell, 75 μ.

On the tip of the abdomen of *Quedius flavicaudus* Sharp, Volcan de Chiriqui, Panama. Sharp Collection, No. 1157.

This large and fine species is allied to *S. Brachyderi*, but is abundantly distinct as a comparison of the figures will show, and in the type material shows no variation except in size.

SPHALEROMYCES QUEDIONUCHI Thaxter. Plate LII, figs. 8–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 39. June, 1901.

Perithecium relatively small, translucent, tinged with amber-brown, straight, very slightly almost symmetrically inflated; the tip hardly distinguished; one of the lip-cells forming a blunt, terminal, irregularly curved, hyaline, sometimes abruptly distinguished projection, below the base of which arises on the inner side a tongue-like outgrowth externally and basally blackish brown, the broad rounded hyaline end of which is curved against or across the base of the terminal outgrowth; the stalk-cell small, the basal cells collectively larger, and separated from it by a very oblique septum. Basal cell of the receptacle long, black, obconical, the narrow base translucent; the subbasal cell small, nearly triangular. Appendage consisting of five very obliquely superposed cells, the two lower nearly equal, the cells above successively smaller, but equal in length; the branches which are once or twice branched and extend about to the middle of the perithecium, arising from the whole surface of their inner margins, the terminal cell soon destroyed. Spores 55 × 3 μ. Perithecia 135 × 36 μ. Basal cell of receptacle 120 μ. Appendage without branches 55 μ. Total length to tip of perithecium 290–310 μ.

On the abdomen of *Quedionuchus impunctus* Sharp. San Andres, Vera Cruz. Sharp Collection, No. 1105.

A species distinguished by its small blunt perithecium, and almost wholly opaque basal cell, but nearly allied to the three preceding species.

Sphaleromyces Latonæ nov. nom. Plate L, figs. 1–3.

Corethromyces Latonæ Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 41. June, 1901.

Perithecium reddish brown with a purplish tinge, often straight, or externally concave, slightly inflated; the lip-cells forming a small short, slightly bent, nearly cylindrical, truncate, or papillate terminal projection, which is rather abruptly distinguished; the secondary stalk-cell, and the basal cell above it, bulging outward more or less prominently, and separated by a rather conspicuous irregular indentation: the stalk-cell small and squarish. The basal cell of the receptacle asymmetrical; its anterior margin straight and perpendicular, the posterior slightly curved and oblique; its distal margin oblique with a posterior protrusion; its slender base translucent, but otherwise opaque, the opacity involving a portion of the small flattened subtriangular subbasal cell. The appendage consisting of a series of about five successively smaller hyaline cells, the lowest greatly flattened; the series above, the distal cells of which soon disappear, often turned outward so as to become almost horizontal in position, giving rise from their inner sides to numerous hyaline branches, which may be more or less copiously branched. Spores about 35 × 2 μ. Perithecium 90–105 × 20–25 μ, the stalk and basal cells together 20–25 μ. Receptacle 110 × 50 (distal end) × 10 μ (base). Total length to tip of perithecium 225–250 μ.

On the legs and abdomen of *Latona Spinolæ* Guér. Bogota, Columbia. Berlin Museum, No. 834.

Although I have been unable to determine with absolute certainty, young specimens of this species appear to produce solitary antheridia on the branchlets, and I have therefore included the species in *Sphaleromyces* to which in other respects it corresponds exactly; although somewhat peculiar from its condensed primary appendage and large opaque distally prominent basal cell. The types were found in company with *Laboulbenia Latonæ* on various parts of the host.

SPHALEROMYCES OBTUSUS Thaxter. Plate LII, figs. 11–13.

Proc. Am. Acad. Arts. and Sci., Vol. XXXV, p. 440. April, 1900.

Perithecia relatively large, clear dark brown becoming almost opaque; the inner margin nearly straight, the outer strongly convex; tapering very slightly basally and distally; the tip paler brown, abruptly distinguished, and when viewed sidewise flaring, with straight divergent lateral margins, the distal margin as broad as the portion of the perithecium below the tip, and slightly concave, the outer lips more prominent and much broader than the inner: when viewed at right angles to this position the tip appears in general bluntly rounded, not expanded, the more or less papillate tips of the lip-cells situated in asymmetrical pairs, which are visible above and below a broad bluntly rounded median portion between them: the basal cells colored like the perithecium, distinct, hardly broader than the stalk-cell which is hyaline contrasting thick-walled and about twice as long as broad. Receptacle small, suffused with brown, two celled; the septa somewhat oblique, the upper cell contrasting abruptly with the colorless stalk-cell, and giving rise laterally to the slightly divergent appendage, which consists of from five to six nearly opaque brown cells, separated by oblique septa; each producing distally on the inner side a short hyaline branch, sometimes once branched. Spores about 40 × 3.5 μ. Perithecia 140–150 × 40–45 μ, the stalk-cell 35 × 20 μ. Receptacle not including foot 27–35 × 10 μ. Appendage, mostly broken 70–100 μ. Total length to tip of perithecium 230–245 μ.

On *Lathrobium Illyricum* Dej., British Museum, No. 384. Algeria (?). On superior surface of abdomen.

SPHALEROMYCES PROPINQUUS Thaxter. Plate LII, figs. 14–16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 441. April, 1900.

Like *S. obtusus* in size, form, and color, except that the tip of the perithecium is symmetrical or nearly so, the lips forming a broadly rounded blunt terminal prominence with sometimes a slight median elevation, while at the base the tip is characteristically broadened through the presence of distinct lateral elevations on either side: the stalk-cell rather abruptly swollen below the basal cells of the perithecium.

On *Lathrobium*, sp. indet., British Museum, No. 383. Europe. On superior surface of abdomen.

This species is doubtfully separated from *S. obtusus* on account of the very different conformation of the tip of the perithecium, which, as the material in either case occurred in the same position on the host, can hardly be due to position of growth. Their retention as distinct species is, however, only provisional.

CERAIOMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 410. March, 1901.

Structure of the perithecium as in *Laboulbenia*, its stalk-cell united to the free base of the free stalk-cell of the appendage, which bears a well differentiated insertion-cell terminally, from the end of which are borne antheridial branches, their successive cells producing terminally either successive secondary branchlets, or antheridia or both. Receptacle two-celled.

This genus is in some respects very similar to *Laboulbenia*, with species of which it might be confused on superficial examination. It differs in possessing an appendage, the stalk-cell of which is free from the stalk-cell of the perithecium. The main appendage, moreover, consists of but two superposed cells terminated by an insertion-cell which does not necessarily give rise to outer and inner branches. As in species of *Dimeromyces* and *Rhizomyces*, the two forms herewith illustrated differ in their relation to the host; *C. Dahlii*, which grows on a soft-bodied fly, being characterized by a copiously branched rhizoid that enters the body cavity, whereas *G. Selenæ* is attached by the usual blackened foot.

Ceraiomyces Dahlii Thaxter. Plate XLIII, figs. 3–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVI, p. 410. March, 1901.

Perithecium large, blackish brown, with an olive shade, becoming opaque, usually slightly curved, tapering gradually to the slender undifferentiated tip; the anterior lip-cells forming two appressed hyaline-tipped finger-like projections; the base very broad, translucent, dull brownish, bulging conspicuously below the venter, especially on the left side; the stalk-cell small, nearly isodiametric, united on its inner side to the base of the stalk-cell of the appendage. The latter free, though often in contact with the base of the perithecium, dull blackish olive, outwardly inflated, narrower terminally where it bears the characteristically differentiated basal cell of the appendage, which becomes almost opaque and is somewhat flask- or bottle-shaped with a rounded extremity, from which, typically, two divergent branches arise which in turn may branch one to three times subdichotomously; the long slender flask-shaped antheridia borne, one to two together, distally from the successive cells. The basal cell of the receptacle nearly spherical, penetrating the host by a long filament which is slender except for an enlargement immediately below the integument of the host, simple at first but becoming more or less copiously branched; the upper cell very large and elongate. Spores about 30 × 3 μ. Perithecium 275–310 × 55–60 μ; the base, including the stalk-cell, 68–72 × 58–68 μ. Appendage 75–85 μ (the basal cell 18 × 12 μ), the stalk-cell 40–45 × 18–22 μ. Receptacle 175–240 × 35 μ (the basal cell 20–22 μ). Total length to tip of perithecium 400–675 μ, average 550 μ.

On various parts of a small flower fly. Ralum, New Pomerania. Berlin Museum, Nos. 1283 and 1298.

This species is conspicuous from its large size and dark color, and growing, as it often does, projecting forward from the head of its host, was at first mistaken for an antenna. The many peculiarities of this fine species need hardly be pointed out, and are clearly indicated by the accompanying figures. In all the specimens the black insertion-cell gives rise to two antheridial branches. The species has been named after Dr. Dahl of the Berlin Museum, from whose collections of Papuan Diptera so many interesting Laboulbeniales were obtained.

Ceraiomyces Selinæ Thaxter. Plate XLIII, figs. 7–8.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 26. June, 1902.

Receptacle pale dirty brownish, becoming gradually somewhat broader distally, the foot blackish brown, not clearly distinguished, the subbasal cell longer than the basal. Stalk-cell of the perithecium slightly longer than broad, the basal cells forming a hyaline neck bent above the stalk-cell and not distinguished, except in color, from the body of the perithecium, which is nearly straight, symmetrical, dull purplish brown, tapering gradually to the slightly asymmetrical apex; the tip hardly distinguished by a slight external elevation. Stalk-cell of the appendage more or less strongly curved, or recurved so that the appendage bends downward; the insertion-cell slightly broader than long, blackish purple below, separated by a slightly oblique septum from the much larger cell above it, from which four or five branches arise distally; the branches simple, or sparingly branched, hyaline or reddish brown, sterile or bearing antheridia. Perithecia 125–150 × 30–35 μ, the stalk-cell 22–25 μ. Receptacle 200–325 × 25–30 μ. Appendages 185–400 μ. Total length to tip of perithecium 219–490 μ.

On the prothorax of *Selina Westermanni* Mostch., India Orient. (labelled "Tranquil"), Berlin Museum, No. 976.

The only two specimens of this species that were obtained are figured in the accompanying plate. It looks at first sight like a somewhat malformed *Laboulbenia*, but the essential characters correspond exactly with those of the preceding species. The insertion-cell bears but a single appendage, however, and the host is not penetrated by any rhizoid. The host in this case is a carabid beetle and the genus *Selena* is said to be synonymous with *Ega*.

LABOULBENIA Robin. I. p. 308

Taken as a whole the characters of this very large and varied genus are remarkably constant as far as the general type of structure and development are concerned, and I have little to add to the account already given in my Monograph. As I have there pointed out the type is peculiar from the fact that the so-called receptacle here, is not homologous with that of its simpler allies, like *Rhadinomyces* for example, but includes in addition to the primary two-celled receptacle of such forms, a cell series of very constant characters which results from the adnation of the basal portion of a primary appendage with the stalk-cell, and usually with some of the basal cells, of the perithecium. This pseudo-receptacle gives rise, then, to a single perithecium on one side and on the other to appendages which are in reality branches from the adnate primary appendage. The arrangement of cells in this combination is, in general, so regular and constant that it has been found possible and convenient to number the successive cells. The basal and subbasal cells, representing the primary receptacle of the simpler forms, are numbered I and II respectively; the primary appendage includes cells III to V, the latter a double cell which, like cell IV, is normally separated from the "appendages" by a blackened insertion-cell. Of the remaining cells, cell VII corresponds to the normal perithecial stalk-cell of many other genera, which in this instance is never free.

The more important variations which are met with among the members of the genus are for the most part associated with secondary divisions of the distal portion of the "primary" appendage, that is to say of cells IV–V and of the insertion-cell. *Laboulbenia olivacea*, for example, is a unique instance in which such a division of cell IV appears to be invariable (Plate LV, fig. 3). In *L. Anaplogenii* also, although the phenomenon is neither regular nor invariable, the same cell may be divided by one or even more septa, becoming thus to some extent proliferous distally and externally. The most complicated instances of this nature are seen in some of the aquatic species like *L. ceratophora*, and such forms might on this account be put in a genus by themselves were it not for the existence of various species showing transitional conditions.

Normally the free appendages consist of an outer and an inner, arising immediately above the insertion-cell from corresponding basal cells; but through the subdivision of these basal cells, as well as of the insertion-cell, the normal arrangement may be wholly confused, as in the instances last mentioned. A further modification which is unusual, is seen in *L. proliferans* and its varieties (Plate LIII) in which certain secondary cells, resulting from the proliferation of cell V, may give rise to a more or less copious production of secondary appendages. Similar tendencies toward irregular division of the appendages, as well as of cell IV and of the insertion-cell, are also seen in *L. Clivinalis* (Plate LXI) and several allied species, although a perfectly normal type may be associated as in this species, with such abnormalities.

It is evident that this large genus is a modern one, in which species making is in active progress, and it is thus an extremely difficult one to treat from a systematic standpoint; especially in view of the limited material usually available for study, and the poor condition in which such material is found in collections, on dried insects which have in general been previously soaked in alcohol, and it must often be a matter of opinion whether species, or varieties, or regional variations are in question. In endeavoring to put in order the almost endless variations of the simpler, or "*flagellata*" type, I do not feel that I have in all cases been consistent in my view of what constitutes a variety and what a species. For example under *L. Texana* and *L. proliferans* certain apparent variations are distinguished by varietal names, while from *L. orientalis* I have separated as species, *L. japonica*, *L. pusilla* and *L. rhinophora*, although the differences in these cases are no greater, perhaps, than they are in cases where the varietal designation has been applied. I do not feel at all sure that it would not have been better to discard varietal designations entirely, or at least in *L. Texana*, *L. proliferans* and *L. cauliculata*, in recognition of the fact that in these cases species making is in progress, although the forms do not appear to have become so well defined as they are, for example, in a majority of the numerous closely allied species of the remarkable "*Galeritæ*" group.

Apart from a crowd of forms which it is very difficult to assemble about any very definite type species, there are several subdivisions of the genus which may be distinguished with some definiteness; and among these that which occurs on water beetles belonging to the Gyrinidæ, and which may be grouped about *L. Gyrinidarum* as a type, is perhaps one of the most clearly defined. This group, instead of suggesting primitive conditions, which might be expected to throw light on possible aquatic ancestors of the family as a whole, appears to illustrate, rather, one of its most highly developed types, as is indicated by the greater complexity of the receptacle, appendages and, in many cases, of the perithecium. The more complicated members of this group, however, are directly connected with the terrestrial types through forms like *L. variabilis*; while it contains within itself a certain number of simpler forms like *L. coarctata*, for example, in which the receptacle is absolutely normal. Among these aquatic species, of which there are about twenty, *L. aquatica* alone shows a copious development of typical flask-shaped antheridia, while in the others no bodies have been observed which can certainly be regarded as organs of this nature. It should be mentioned, however, that material of these forms is almost invariably in bad condition, and that I have made no attempt to reexamine fresh material of the common forms on American *Gyrini* in order to determine this point.

A somewhat similar and very curious tendency to secondary division, not only in the distal cells of the receptacle, but in the basal cells of the appendages as well, is also seen in the group of forms referred to above, occurring on *Clivina* and allied carabid genera *Schizogenius*, *Morio*, etc., although in these cases the tendency has not become fixed, as is illustrated in figures 5–6 of Plate LXI.

As might be expected in a genus which includes more than two hundred species, the parasitism of the latter is unusually varied; and although the Carabidæ among the beetles harbor the great majority, forms are known to occur on Staphylinidæ, Gyrinidæ, Cicindelidæ, and several other orders among the Coleoptera; on Diopsidæ among the flies; on Termites among the Neuroptera; on two Gamasid mites, and even on ants. It is rather remarkable that such extreme differences in hosts have, in most instances, induced no considerable departure from the conventional type, even in cases where the character of the host is so unusual as in those of *L. Hageni* and *L. Formicarum* which occur on Neuroptera and Hymenoptera. Whether the forms on Gamasidæ (*L. armillaris* and *L. Napoleonis*) are aberrant, it is hardly possible to determine from the published figures; but these hosts might certainly be expected to harbor very peculiar species.

The distribution of the species corresponds in some instances to that of the genus of host insects, as in the case of *L. cristata* which occurs in all the continents; although the members of the large genus *Pæderus* which it infests, are very varied and numerous. On the other hand certain forms seem to be decidedly restricted. *L. variabilis*, for example, which occurs on a variety of carabid hosts and even on one genus of tiger-beetles, seems certainly not to occur outside the American continents. *L. Philonthi*, also, which occurs on members of one of the largest and most widely distributed genera of the Staphylinidæ, is only found in North and South America. In the two instances last mentioned, enough exotic material of the hosts has been examined to make it reasonably certain that the species are thus restricted, and this is doubtless true of many other forms in connection with which the data are less complete. Among still more restricted forms the species on Hawaiian Carabidæ may be mentioned, although they are in general not confined to special genera; while numberless forms have as yet been seen only on members of the same host species, or genus, and from single localities.

In attempting to arrange the species serially, and at the same time bring together groups of evidently related forms, a confusion has resulted in the following enumeration, through the unavoidable juxtaposition of unrelated species, and it would have been in some respects less misleading to have adopted an alphabetical arrangement. The different groups of species, where groups can be distinguished, center about the so-called normal, or *flagellata*-type. For example the whole series on American *Galeritæ*, already referred to, which comprises about twenty-five species, has apparently come from some type similar to that of *L. Mexicana*, which is found widely distributed on the same hosts. The same may be true of the group comprising *L. Pachytelis, L. Pheropsophi, L. Texana* with its varieties, and other related forms; some or all of which may have come from *L. Darwinii*, or a similar type. The series of *L. proliferans* and its varieties, comes also directly from a normal type through the proliferation of cell V; and further abnormal divisions in this region result in the type of *L. variabilis*, which passes directly to the types already referred to as seen in the aquatic parasites of Gyrinidæ, which themselves vary to forms possessing quite normal receptacles.

In my Monograph I called attention to certain abnormalities which were of interest as showing that the sexual characters did not appear to be inherent in any special cells of the receptacle, although the primary branches of the subbasal cell are normally antheridial and procarpic respectively. In this way perithecia may be wholly or in part replaced by antheridial branches, and, especially in African forms of *L. proliferans*, instances occur in which perithecia may arise secondarily from the subbasal cell, or even other cells of the receptacle.

LABOULBENIA FASCICULATA Peyritsch.

L. brachiata Thaxter, Proc. Am. Acad. Arts and Sci., Vol. XXIV, p. 11.

The figures of this species given by Peyritsch give so incorrect an idea of its characters, that I felt no hesitation in separating the American form. An examination of European material on the same hosts on which it was observed by Peyritsch clearly indicates, however, that the two are identical. Material has been examined, from the Florence Collection on *Platynus dorsalis* Müll., on *Patrobus excavatus* Payk. and on *Chlænius vestitus* Payk., all of which were Italian; in the British Museum on *Patrobus rufipes* Fabr., from Britain, No. 638; on *Brachinus* sp., China (?) No. 535; the last two differing somewhat in color but structurally identical with the North American and European types. Closely allied to *L. proliferans* and resembling especially the varieties *divaricata* and *interposita*, it is always separable from the fact that the insertion-cell is undifferentiated and is not directly related to the basal cell of the inner appendage. Each basal cell of the appendages, moreover, as well as the secondary appendiculate cells which result from the proliferation of cell V, bear in the present species more than a single branch or appendage; while the basal cells of the latter are relatively large and somewhat inflated, and all the lower septa are black and somewhat oblique. The species bears also a certain resemblance to *L. variabilis* to which it may be related.

Laboulbenia proliferans Thaxter.

This species presents a plexus of variations, several of which it has seemed desirable to distinguish by varietal names and some of these like the var. *cincta* or var. *atrata* might be considered by some persons as specifically distinct. But although these seem very constant, for example on a given host from a given locality, there are so many of them and they are otherwise so variable that it has appeared wiser to regard them all as representing a single species which is undoubtedly in a very plastic condition, and from which a number of species are likely eventually to separate themselves. Whether such a separation has not actually begun is perhaps a matter of opinion. If we take the well defined African form Var. *atrata*, it might well be considered specifically distinct from the normal form as it occurs for instance on Asiatic species of *Chlænius*; yet the var. *interposita* on African *Chlænii*, which approaches *atrata* very closely, becomes identical with the Eastern form on *Chlænius* when, as actually occurs in a few individuals, the blackened septa are absent at the bases of its acessory appendages; while var. *divaricata*, again, could hardly be separated from *atrata* if these blackened septa were added.

Among the minor variations which I have seen the following deserve mention. British Museum No. 604 on *Chlænius pallipes* Gebl. from Japan differs in possessing a receptacle the lower part of which is very slender, cell I being nearly isodiametric, slender, usually abruptly curved above its base, with a more or less well marked prominence distally and anteriorly just below cell II.

Berlin Museum No. 918, on *Brachionychus sublævis* Chaud. from Salang I., Siam, though not otherwise peculiar, has an outer appendage similar in type to that of *L. spiralis* or *L. flaccida* (Plate LVIII).

Berlin Museum No. 930, on *Chlænius xanthacrus* Wied., from Bengal, is a small form, the distal portion of the receptacle relatively large and diverging from the relatively small perithecium.

British Museum No. 596 on *Clæniomus gracilicollis* Jnk. from Turkestan, is a pale form peculiar for the characteristic wine-red color of its insertion-cell.

Hope Collection on *Chlænius* sp. No. 320, from Ceylon, has copious accessory branches, which are hardly divergent, and 750 μ in length.

Minor variations in color, size and form of the receptacle, perithecium and appendages are common, as well as in the degree of proliferation in cell V (which is rarely quite normal), the number of accessory appendiculate cells cut off rarely exceeding five and usually not more than two in number.

In a few individuals of the normal type (Paris 51, on *Chlænius* sp., Algeria, and No. 83 on *Eudema*, Africa, the subbasal cell of the receptacle has organized procarps and perithecia, and in one case two have arisen after a division of this cell. This appears to occur usually when the primary perithecium aborts for any reason, or is destroyed; but in one instance both primary and secondary perithecia appear to be functional.

A complete list of the material examined since the publication of my Monograph, and exclusive of the named varieties, is as follows; — British Museum: No. 588 on *Eudema conica* Murr., Old Calabar, Africa; No. 589 on *E. microcephalus* Dej., Sierra Leone; No. 596 on *Chlæniomus gracilicollis* Jnk., Turkestan, No. 598 on *Chlænius spoliatus* Rossi, Andalusia; No. 601 on *C. marginellus* Dej., Delagoa Bay, Africa; No. 603 on *C. æneipennis*, Port Natal, Africa; No. 604 on *C. pallipes* Gebl., Japan; No. 605 on *C. bimaculatus* Dej., Java; No. 608 on *C. marginatus* Dej., Hong Kong; No. 610 on *Rhembus* sp., W. India. Paris Collection: No. 20 on *Chlænius* sp., Madagascar; No. 51 on *Chlænius* sp., Algeria; No. 83, on *Eudema* sp., Africa; No. 87 on *Chlænius* sp., Java; No. 134 on *Chlænius* sp., Japan; No. 140 on *Chlænius* sp., Asia. Hope Collection: No. 320 on *Chlænius* sp., Ceylon; No. 335 on *Craspedophorus* sp., West Australia; No. 381 on *Eudema Erichsonii* Hope, Africa. Berlin Museum: No. 918 on *Brachionychus sublævis* Chaud., Salang Island, Siam; No. 923 on *Chlænius biguttatus* Motsch, Japan; No. 929 on *C. Schaumii* West., "Tranquil": No. 928 on *C. Javanus* Chd., Java; No. 924 on *Chlænius* sp., New Guinea; No. 930 on *C. xanthocerus* Dej., Bengal. Sharp Collection; No. 1106 on *Pheropsophus Hispanica* Dej. Spain; also on *Chlænius velutinus* Duft., from Italy? in the Florence collection. The specimen on

Pheropsophus from Spain is immature but appears certainly to belong here. I hope to illustrate this species more fully in a future paper.

The varieties of this species which it has been thought desirable to distinguish by special names are as follows:

var. *Liberiana* Thaxter. Cell V constantly once-proliferous, the accessory appendage simple, distinguished by a broad opaque black base. Type on *Eudema* sp., Liberia (Cooke); British Museum No. 591 on *E. arcuatocolle* Murr., Old Calabar: Paris Museum Nos. 84 and 152 on *Eudema* sp., Congo, Africa, in the original figure of this variety (Monograph, Plate III, fig. 7) the septum separating cell III from cell IV, was not inked in before reproduction, so that the figure is incorrect to this extent. The septum is almost exactly horizontal, and the two cells which it separates are about equal in length. The additional material obtained since this variety was described resembles the type in all respects.

var. CINCTA Thaxter. Plate LIII, fig. 5.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 53. June, 1902.

Perithecium borne on a black base resembling a normal insertion-cell; cell V several times proliferous, each cell bearing a simple accessory appendage distinguished by a broad black basal suffusion. On *Eudema sinuaticolle* Laf., Lagos, Guinea; British Museum, No. 590. On *E. grossum* Hope, Old Calabar, Africa; British Museum, No. 587. On *Episcosomus* (*Eudema*) *grossus* Hope, Africa; Paris Museum, No. 81. On *Craspedophorus adæquatus* Kolbe, Bismarkdorf, Togo, Africa; Berlin Museum, No. 919, and Kamerun, Africa; Berlin Museum, No. 912. On *C. Congoanus* Kolbe, Kimpoko, Congo, Africa; Berlin Museum, No. 907. On *C. Preusii* Kolbe; Barumba Station, Kamerun, Africa; Berlin Museum, No. 910. On *C.* (*Eudema*) *Strachani* Hope, Togo, Africa; Berlin Museum, No. 913.

This variety is entirely similar to the var. *Liberiana* except that cell V is more than once proliferous, and that the perithecium is seated on a clearly defined black base which is like the normal insertion-cell of this genus. In the latter respect the variety is quite unique, since no other member of the genus shows any such tendency. The black portion appears to result from the modification of two cells (cells g and d, Monograph, Plate II, fig. 17).

var. ATRATA Thaxter. Plate LIII, fig. 2.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 53. June, 1902.

Cell V twice to five times proliferous, the accessory appendages distinguished by thick black bases and either divaricately once- or twice-branched, or simple. Very variable in size, the type on *Rhopalomelus* (Berlin No. 921) over 1.5 mm. in length, while specimens on *Rhopalomelus* from Port Natal (British Museum, No. 630) are only 450 μ to tip of perithecium. A fine variety, which, in the absence of intermediate forms, would never be specificially associated with the normal form of *proliferans*. Specimens in which the accessory branches are simple (Berlin 909 and 908, Brit. Mus. 630) resemble var. *cincta* exactly, except that no blackened base is distinguished below the perithecium. On *Chlænius Dohrini* Bert., Tropical E. Africa; Berlin Museum, No. 226. On *Euchlænius trochantericus* Kolbe, Njam Njam, Semnio, Africa; Berlin Museum, No. 921. On *Craspedophorus nucatus* Harold, "Regne Lugna"? Africa: Berlin Museum, No. 908. On *C. Westermanni* Laf., Togo, Africa; Berlin Museum, No. 909. On *Rhopalomelus angusticollis* Boh., Port Natal, Africa; British Museum, No. 630. On *Rhopalomelus* sp., Africa; Hope Collection, No. 311.

Var. **interposita** nov. var. Plate LIII, figs. 3–4.

This name may be used to designate a form on African species of *Chlænius* which resembles var. *atrata* from the fact that one or all of its accessory appendages may be distinguished at the base by blackened septa, although specimens occur in which no such blackening is present. It resembles the Asiatic forms of the species on the same host in general form, and in the Type (British Museum No. 599 on *Chlænius* sp., Angola), has the same pale straw yellow coloring often seen in material from this region.

Specimens from Delagoa Bay, however, (Brit. Museum, No. 600) and from Sierra Leone (B. M. No. 602 on *C. venator*) are suffused with dark brown in most cases.

Var. DIVARICATA Thaxter. Plate LIII, figs. 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 53. June, 1902.

Cell V once proliferous or sometimes normal without proliferation, the primary appendages copiously several times branched, the branches or branchlets commonly more or less marked by basal blackish suffusions, divaricate, slender, tapering, flexuous. On *Chlænius* sp., Sandakan, Borneo; British Museum, No. 664, Type. On *Chlænius* ? sp., Victoria, Australia; Hope Collection, No. 339. On *Notonomus viridescens* Chaud. (?), New Zealand; Paris Museum, No. 159. On *Bembus gigas* Bates, Japan; Paris Museum, No. 133. On *Rhembus lævis* Lesne, Java; Paris Museum, No. 109.

LABOULBENIA CRASPIDOPHORI Thaxter. Plate LIII, figs. 8–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 32. June, 1902.

Perithecium relatively large, almost wholly free, erect, usually bent slightly inward toward the base and outward toward the tip, becoming almost opaque dark brown; the tip rather small, hardly distinguished, bent slightly outward; the lip edges pale, outwardly oblique. Receptacle usually rather slender, the basal and subbasal cells relatively large and long, faintly suffused with brown, the upper longer, separated from cell III by a narrow horizontal septum and from cell VI by a very oblique or almost vertical one; the distal portion of the receptacle narrow, but rather abruptly distinguished, especially cells III and IV, more or less deeply suffused, becoming concolorous with the perithecium. Outer appendage long, slender, simple, or rarely distally furcate, curved outward; the basal cell of the inner appendage relatively very small, bearing a single, erect, short, one-celled branch; which, after bearing several antheridia distally, soon disappears. Spores 75 × 5 μ. Perithecia 180–210 × 48 μ. Receptacle 150–325 μ. Appendages longer, 300–375 μ. Total length to tip of perithecium 280–500 μ.

On *Craspidophorus tenuipunctatus* Laf., East Indies; British Museum, No. 592. On *Panagæus* (*Eudema*) *Symei* Murr., Old Calabar, Africa; British Museum, No. 594. On *Microsomus* (*Eudema*) *vicinus* Murr., Gaboon, French Congo, Africa; Berlin Museum, No. 920. On *Craspidophorus* (?) sp., U. S. National Museum, Liberia, Africa, No. 8.

This form is allied to *L. proliferans*, and although from a description alone it might be readily confused with other species in which the outer appendage is single and simple, its characters show sufficient individuality to separate it readily from any other species thus far described. It might be regarded as representing the original simple type from which *L. proliferans* and its varieties have come, and it, moreover, occurs on similar hosts. Its individuality is perhaps best illustrated by the outline of its perithecium which resembles that of *L. proliferans*. The tip is not, however, distinguished as in this species, and none of the individuals thus far examined have shown any tendency to proliferation in cell V.

LABOULBENIA EXIGUA Thaxter. Plate LIII, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 37. June, 1902.

Perithecium relatively very small, the upper third or less free, reddish brown, deeper than the receptacle, erect, straight, nearly symmetrical; the tip clearly and rather abruptly distinguished; the lip-cells with darker shades, distinctly spreading, especially externally, the edges hyaline, nearly horizontal. Basal and subbasal cells of the receptacle subequal small. The insertion-cell broad, well marked. The basal cells of the appendage clearly distinguished, subequal, about as broad as long; the outer bearing a single, simple erect branch, the basal cell of which is abruptly narrower, squarish, deeper brown, the septa dark, the rest of the branch simple, obscurely septate, distally hyaline, tinged with pale brown below; the inner appendage like the outer, shorter, paler, the brownish short basal portion of the single simple branch smaller and without septa. Spores about 40 × 4 μ. Perithecia 86 × 26 μ. Receptacle 220 μ. Appendages 184–150 μ. Total length to tip of perithecium 250–290 μ.

On the inferior thorax of *Chlænius biguttatus* Motsch., Japan; Berlin Museum, No. 923.

Allied to *L. humilis*, but differing in its appendages, and in the conformation of the spreading tip of its perithecium which is itself differently shaped, and differently related to the insertion-cell.

LABOULBENIA HUMILIS Thaxter. Plate LIII, fig. 10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 42. June, 1902.

Rather slender, nearly uniform dirty olivaceous. Perithecia relatively large, straight, erect, the outer margin nearly straight to the lips, or slightly convex; the tip not well distinguished, with darker shades below the rather coarse, pale, outwardly oblique lips. Basal cell of the receptacle relatively large, somewhat paler; the cells above it darker, and transversely, rather coarsely, striate-punctate especially cell II; cell III separated from cell II by a short horizontal septum; cell VI separated from cells II and III by oblique septa; the anterior margin of the receptacle slightly convex, the posterior strongly divergent above cell II. Insertion-cell relatively narrow and thick, the outer appendage short, simple, tapering, four to five-celled, slightly divergent above the basal cell, which is rather long, irregular and paler; the subbasal cell separated by a more or less distinctly oblique septum, where the appendage is slightly geniculate; the inner appendage erect, simple, or the small basal cell producing two pale, short, few-celled, simple branches. Spores about 50 × 5 μ. Perithecia 100–125 × 30 μ. Receptacle about 185 μ. Appendages 60–75 μ. Total length to tip of perithecium 250–275 μ.

On the elytra of *Chlænius monogrammus* Laf., Hong Kong; British Museum, No. 606. On *C. cyaniceps* Bates, Hong Kong; Berlin Museum, No. 925.

This species, although insignificant, is well distinguished by its feebly developed appendages, the form of its perithecium and the conspicuous striation of cell II. It seems to be as nearly allied to *L. Craspidophori* and *L. exigua* as to any other species, but could hardly be confused with either. The form on *C. cyaniceps* is taken as the type and illustrated in fig. 10.

LABOULBENIA BRACHIONYCHI Thaxter. Plate LIII, figs. 11–12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 162. December, 1899.

Perithecium wholly free, rather deeply suffused with smoky or reddish brown, subclavate or almost symmetrically inflated, tapering from the middle to the nearly symmetrical, or externally slightly oblique blunt tip, the basal wall-cells contracted to form a long slender neck-like subhyaline stalk. Receptacle abnormally developed, cells I and II nearly equal, cells III to V forming a stalk which is deeply suffused with blackish brown especially externally, and rather coarsely punctate in the darker areas, of equal diameter throughout and quite free, except at its very base, from the rest of the receptacle: cell IV larger than cell III, cell V small and separated by an oblique septum; cell II often somewhat suffused and distinctly finely punctate; cell I about as long as cell II, and faintly punctate above; cell VII and the basal cells of the perithecium very small. Outer appendage consisting of a basal cell deeply blackened externally, and bearing a long slender simple branch, distally hyaline, more or less suffused with smoky brown toward the base: the inner appendage consisting of a basal cell about half as long as that of the outer producing a single branch on either side which may be once or twice branched, the antheridia borne usually in twos or threes on short branchlets near the base. Spore 110 × 7 μ. Perithecia exclusive of stalk, 270–340 × 65 μ; including stalk 340–430 μ. Total length to tip of perithecium 650–800 μ; to insertion-cell 400–500 μ. Stalk-like portion of receptacle 138 × 38 μ. Appendages 400–470 μ.

On *Brachionychus* sp., Paris Coll. Nos. 99 and 822, Cochin China; on *Episcosoma laticollis*, No. 85, Cochin China; on *Episcosoma* sp., No. 86, Java. Berlin Museum No. 916 on *Microxys robustus* Mor. Japan. Usually on inferior surface of thorax.

This fine species appears to be quite isolated by reason of its peculiarities. Of the other species, *L. anomala* alone possesses a receptacle somewhat similarly developed in relation to the perithecium, but this aquatic form is otherwise totally diverse. The slender neck of the perithecium appears almost to arise from the subbasal cell, cell VI being small and cells II–V forming together a free structure terminated by the insertion-cell. Apart from slight differences in the depth of the suffusions, the Javan, Chinese and Japanese material shows no variations worthy of note. Fig. 11 represents an individual from Cochin China, Paris Museum, No. 9, which is taken as the Type.

Laboulbenia Nebriæ Peyr.

Specimens of this species were obtained in the British Museum No. 458 on *Nebria Gyllenhali* Sch., from Whallen, England: in the Paris Collection on *N. rubicunda* Quens., from Algeria, No. 32. Berlin Museum No. 863, on *N. angustata* Dej., Tyrol, No. 866 on *N. angusticollis* Dej., France.

Laboulbenia vulgaris Peyritsch.

The varieties of this species and its near allies on species of *Bembidium* are in need of thorough revision and illustration, which I have deferred until it becomes possible to examine the large amount of material which I have collected in South America and elsewhere, but which is not yet available for study. It may be mentioned here, however, that material from Greece, Italy, the Canaries, India, Japan and the Hawaiian Islands has been obtained from the European Collections.

Laboulbenia insularis Thaxter. Plate LVI, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 181. Dec., 1899.

Perithecium one third or more free, inflated, dark brown, becoming almost opaque, tapering to the rather pointed apex, the lip-edges hyaline. Receptacle elongate, the distal portion concolorous with the perithecium; cell I suffused with brown above and below, cell II hyaline except for a brown suffusion at its base and distal end. Outer appendage consisting of a large subconical basal cell becoming dark brown and bearing terminally a single short erect slender branch, the two basal cells of which are dark blackish brown, the septa usually oblique; the distal cell somewhat longer than the rest of the appendage, hyaline and soon broken. The inner appendage consisting of a very small basal cell, usually producing a single short hyaline branch about as long as that of the outer appendage. Perithecium 85–95 × 40 μ. Total length to tip of perithecium 215–275 μ; to insertion-cell 200–250 μ. Appendages, longest 100 μ.

On *Bembidium sublimatum* Woll., and *B. Grayanum* Woll., Brit. Mus. No. 409, Island of St. Helena.

This species, though most nearly allied to *L. vulgaris*, differs constantly from forms of that species in the character of its appendages; the outer short, slender, more or less indurated, simple, externally suffused with rich brown, is partly broken in all the adult individuals examined, but is shown from young individuals, fig. 2, to be but slightly longer than is represented in fig. 1.

Laboulbenia perpendicularis Thaxter.

A few specimens of a form not separable from this species were found on the legs of *Bembidium atlanticum* Woll. from Teneriffe: British Mus., No. 420.

Laboulbenia subterranea Thaxter.

The different forms which seem referable to this species are very perplexing; especially those from European caves, which are seldom very like the striking American type-form, yet correspond too closely to some of its variations to warrant a specific separation. The European species of *Trechus,* furthermore, are not infrequently parasitized by a form illustrated on Plate LIII, figs. 14–15 which, though strikingly different from the types of this species, are so nearly identical with its varieties that I have not thought it wise to separate them at present. This variety is characterized by the possession of a simple, usually rigid, stiff outer appendage, the lower cells of which are apt to be more or less elongated, and sometimes of variable diameter, or distally somewhat enlarged as in the two figures referred to. The species approaches some forms of *L. polyphaga,* although it is always sufficiently distinct to be readily recognizable. On several European species of the staphylinid genus *Stilicus* I have also found a form that I am not able to separate satisfactorily from the varieties above mentioned, although it is usually somewhat smaller.

The individual represented in fig. 13 was found on *S. geniculatus* Ehr., from England, and was at first given a specific name corresponding to the host; but although an examination of abundant material may show essential and constant differences, I have preferred to place this form also provisionally under the present species.

Of the forms on *Anophthalmus* the following have been examined: British Museum No. 660 on *A. Doriæ* Fairm., Liguria; on *A. Schmidtii* Sturm., Carniola. Paris Museum on *A. Caranti* Sell., Alpes Maritimes, Italy; No. 188 on *A. Dalmatinus* Mill, Dalmatia; No. 189 on *A. Schaumii* Schm., Haute Carniola. Berlin Museum No. 875 on *A. Motschulskyi* Schm., Carniola; No. 876 on *A. Dalmatinus* Mill., Dalmatia; On species of *Trechus* as follows: British Museum; No. 639 on *T. micros* Hubst., Hungary, also in Hope Coll., No. 323, Europe. Berlin Museum, No. 880 *Trechus* sp., Macugnaga Italy; No. 881 on *T. lævipennis* Heer., Macugnaga, N. Italy; No. 879 on *T. strigipennis* Kies., Monte Rosa, Italy; on *Trechus* sp. Canada; No. 878 on *T. paludosus* Prussia.

On species of *Stilicus*, British Museum: No. 447 on *S. geniculatus* Ex., Cowley, England; No. 446 on *S. similis* Er., Rathay, England. Berlin Museum; No. 837 on *S. orbiculatus* Payk, Europe.

LABOULBENIA ŒDODACTYLI Thaxter. Plate LIV, fig. 10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 189. Dec., 1899.

Perithecium free except at the base, pale transparent amber-yellow, somewhat inflated at the base and tapering gradually thence to the slender tip, a blackish shade below the nearly hyaline lips which are turned slightly outward. Receptacle amber-colored, deeper anteriorly, cell II sometimes elongate, cell VI very short, so that the base of the perithecium comes opposite cell III. Insertion-cell and the inner margin of cell V usually free from the perithecium. The outer appendage simple, divergent, the basal cell very large; the basal cell of the inner appendage much smaller, bearing one to two short branchlets. Spores 35–40 × 41 μ. Perithecia 120 × 35 μ. Total length to tip of perithecium 175–380 μ (longest); to insertion-cell 115–275 μ.

On elytra of *Œdodactylus fuscobrunneus*, Fairm., Brit. Mus., No. 397, Chile.

The material of this species is unfortunately very scanty, the typical form being represented in fig. 10, and recalling *L. Atlantica*, although its color, the conformation of the perithecium and of the receptacle, as well as its slender tapering colorless outer appendage, serve to distinguish it.

Laboulbenia Atlantica nov. sp. Plate LIII, figs. 16–17.

Perithecium dark olivaceous brown, short, stout, about two thirds free from the receptacle; the free portion subsymmetrical, or curved outward; the tip hardly distinguished, bent slightly outward, with darker subterminal suffusions. Receptacle short and rather stout; cells I and II subequal pale dirty yellowish, the distal half, or less, of the latter united laterally to cell VI; cells III and IV subequal, short and broad, and concolorous with the perithecium. Outer appendage yellowish, simple, elongate, divergent, tapering but slightly, rather closely septate, lower cells slightly constricted at the septa; basal cell of the inner appendage bearing a short one-celled branch on either side, from which arise a few antheridia. Perithecium 90 × 70 μ. Receptacle 110 μ. Greatest total width 58 μ. Longest appendage 380 μ.

On elytra of *Lathrobium multipunctatum* Gz., Santa Anna, Madeira; Paris Museum No. 205. On *Gargus Schaumii* Woll., Arribentes, Madeira, Paris Museum No. 212.

Although the hosts of these two forms belong to different families of Coleoptera, I am unable to separate them specifically, the specimens on *Gargus* differing only in the slightly greater relative length of the basal and subbasal cells and in a slight tendency to general curvature in the free portion of the perithecium. The material on *Lathrobium* is taken as the type, one of the individuals from this source being represented in fig. 16, while figure 17 represents an individual from *Gargus*. The species is allied to *L. subterranea* and *L. Œdodactyli*, but seems sufficiently distinct from either.

LABOULBENIA MADEIRÆ Thaxter. Plate LIV, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 185. Dec., 1899.

Perithecium united to receptacle for about two thirds of its length, pale straw-yellow becoming brownish yellow, the whole tip clear contrasting black or blackish brown, the hyaline lip-edges turned outward. Receptacle concolorous with perithecium, rather short, normal, cell V relatively large, its upper margin free between the perithecium and the insertion-cell, the latter oblique, clear black, contrasting. Outer appendage often simple, elongate, sometimes once branched above its subbasal cell; the branches divergent; inner appendage consisting of a basal cell smaller than that of the outer, and bearing one or two short branches commonly three-celled usually terminated by paired antheridia. Spores 75 × 6 μ. Perithecia 100–130 × 35–40 μ. Total length to tip of perithecium 225–250 μ; to insertion-cell 175–210 μ. Appendages, longer 350 μ.

On *Calathus complanatus* Dej., Paris Museum, No. 211, Madeira. On elytra.

Through the enlargement of cell V, the broad insertion-cell in this species is thrown out free from the perithecium, which is relatively small, and united to the receptacle up to a point not far below its broadly blackened blunt apex. A sufficiently characteristic form, but without striking peculiarities.

LABOULBENIA ERECTA Thaxter. Plate LIV, figs. 20–21.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 175. Dec., 1899.

Perithecium pale yellowish brown, slightly and evenly rounded, united to the receptacle as far as its subterminal cells, the nearly symmetrical tip rather broad, often flattened distally, becoming deeply suffused with blackish, except the narrow translucent margins of the lips. Receptacle pale yellowish, cell I short and stout, distally suffused with blackish brown; cell VI very small, cell V free from the perithecium, sometimes lateral. Insertion-cell thick and black, sometimes carried forward opposite the apex of the perithecium through the elongation of cells IV and V. Outer appendage consisting of a large basal cell several times longer than broad, which may bear terminally one or two branches, the outer sometimes once branched, the branchlets very long, slender, tapering, hyaline or pale yellowish, more or less flexuous: the inner appendage sometimes laterally placed, usually single, simple, consisting of two or three short cells with one or two lateral antheridia and sometimes producing longer branchlets, the basal cell much smaller than that of the outer appendage. Perithecia 110–120 × 35–40 μ. Total length to tip of perithecium 200–275 μ; to insertion-cell 200–250 μ. Appendages, longest 675 μ.

On *Colpodes agilis* Chd., Jalapa, Mexico, Brit. Mus. (Biologia Coll.), No. 696; on *C. evanescens* Bates, U. S. National Museum, Biologia Coll., Mexico. Elytra.

Five specimens of this form in good condition have been examined, three from *C. evanescens* (fig. 20), having somewhat longer appendages, but not differing otherwise from the two on *C. agilis* (fig. 21). The tip of the perithecium appears to be turned in all cases so that the view is anterior, or posterior, instead of lateral. The distal portion of the perithecium also may be so twisted that cell V is hardly visible beside cell IV, a condition similar to that which is the normal one in *L. paupercula*. This species appears to be allied to *L. flagellata* and resembles *L. Madeiræ* in some respects.

LABOULBENIA ORTHOMI Thaxter. Plate LIV, fig. 14–15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 192. Dec., 1899.

Perithecium free, long and straight, slender, sometimes slightly inflated distally, deep clear brown; the tip broad, prominent, not abruptly differentiated; the lips rather large and prominent, the lower wall-cells as a rule elongated to form a hyaline neck, usually well marked and contrasting with the body of the perithecium. Receptacle often shorter than the perithecium, faintly punctate, olive-brown, except the hyaline or slightly yellowish basal cell, or pale dirty brownish yellow, with distal deeper olive suffusions. Insertion-cell not as broad as cell IV. The outer appendage normally simple, the basal cell longer than broad, blackened externally, as are also the two cells which lie above it, the subbasal cell and even the cell above it rarely giving rise to erect simple branchlets. The inner appendage consisting of a basal cell similar to that of the outer, and producing on either side a straight hyaline erect branch. Spores 50 × 4 μ. Perithecia 130–140 × 30–35 μ exclusive of the variably developed neck, which may be 18 μ long. Total length to tip of perithecium 260 μ; to insertion-cell 100 μ; width 40 μ. Longer appendages 200–270 μ.

On margin of elytra of *Orthomus* (*Argutor*) *aquilus* Coquer, Algeria, Paris Museum, No. 41.

The typical form of this species, which is represented in fig. 14, is a clearly defined and readily recognizable type; yet among the individuals examined with which this type form was associated, are several variations, notably the elongate form represented in fig. 15, which measures about 380 μ to the tip of the perithecium, lacks the well defined hyaline neck at the base of the latter, and in which the elongate receptacle is dirty brownish yellow, with olive shades, only, in the distal region. The outer appendages are normally simple, and where branches occur, they appear always to have arisen as the result of injury.

Laboulbenia Dryptæ Thaxter. Plate LIV, fig. 19.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 35. June, 1902.

Perithecium usually nearly straight, often nearly symmetrical, the region corresponding to the basal wall-cells usually distinctly differentiated, hyaline or transparent, brownish, becoming darker in older individuals, concolorous with the basal and other cells below; but in general contrasting strongly, but not abruptly, with the rich dark brown of the rest of the perithecium above it, which may become opaque; the tip often bent slightly outward, not abruptly distinguished; the inner lip-cells more prominent and deeply suffused, except the edges. Receptacle rather short, punctate, becoming more or less and rather irregularly stained with brown, often blackish along the posterior margin up to the insertion-cell, which is thick, well defined, contrasting. The appendages rather slender; the outer nearly straight in normal individuals, simple, divergent, rigid, tapering; the basal cell more than twice as broad, subhyaline, with brownish suffusions next its deep black contrasting outer wall, the opacity sometimes involving the subbasal cell, which is similar and similarly blackened externally, as is the cell next above: the inner appendage simple, or more often once branched above the subbasal cell, divergent like the outer, brownish yellow, the antheridia borne singly from the lower cells. Perithecia 110–150 × 35–40 μ. Receptacle 135–180 μ. Longer appendages 220 μ. Total length to tip of perithecium 220–250 μ.

On *Drypta ruficollis* Dej., Natal, Africa; British Museum, No. 506.

This species is perhaps as closely allied to *L. Orthomi* as to any other, and is distinguished from the fact that the basal cells of the perithecium form an enlargement below the latter, rather than a more slender neck. The form and relative size of the perithecium are also different.

Laboulbenia melanaria Thaxter. Plate LIV, fig. 18.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 186. Dec., 1899.

Perithecium nearly free, uniformly suffused with clear blackish brown, straight or bent slightly outward; the tip more deeply colored, the lip-edges hyaline, contrasting, externally oblique. Receptacle hyaline becoming yellowish, often suffused with blackish brown except the lower portions of cells I, III, and VI, and usually cell V. Outer appendage consisting of a basal cell mostly free, bearing terminally a single branch typically once branched above its basal cell, the branchlets elongate, thick-walled, rigid, more or less tinged with brown. The inner appendage consisting of a much smaller basal cell, producing either a short two-celled branch with one or two terminal antheridia, or two longer branches which may be once branched; the branches like those of the outer appendage but shorter. Perithecium 120 × 35 μ. Total length to tip of perithecium 275 μ; to insertion-cell 150 μ. Appendages, longest, 550 μ.

On *Diachromus germanus* Linn., Florence Museum, Florence. Hope Coll. No. 344½, 319, France and Portugal; on *Anisodactylus militaris*, No. 315, Sardinia; on *A. heros* Fabr., No. 316, "Europe."

This is a characteristic form, occurring usually on the elytra of its host, distinguished by its long, apparently invariably once-furcate outer appendage, long clear brown blunt tipped perithecium, and hyaline, or but slightly suffused receptacle. The figure, which represents one of the types on *Ophonus*

(*Diachromus*) *germanus*, from Portugal, does not give a correct idea of the rich brown even suffusion of the perithecium.

LABOULBENIA MADAGASCARENSIS Thaxter. Plate LXI, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 184. Dec., 1899.

Perithecium free, mostly straight, the inner margin more convex, uniformly clear dark brown or blackish except just below the black tip, abruptly distinguished from and contrasting with the receptacle; the tip rather abruptly distinguished, straight or bent slightly inward, with hyaline lip-margins, the wall-cells with a slight spiral turn. Receptacle hyaline or finally yellowish, cells III and VI about equal. Insertion-cell opposite base of perithecium. Outer appendage consisting of a rather small basal cell, its outer wall blackened, the blackening continuous with the insertion-cell, usually producing distally two branches, an outer blackened externally or suffused with brown at its base and once branched, and an inner usually simple and hyaline. The inner appendage consists of a basal cell like that of the outer, and produces a single branch on either side which may be once branched, all the branchlets of both appendages rather stout and stiff, tapering, slightly curved outward, hyaline or becoming dirty yellowish. Perithecia 100–120 × 40–45 μ. Total length to tip of perithecium 240–270 μ; to insertion-cell 140–155 μ. Appendages, longest 250 μ.

On margins of both elytra of a carabid allied to *Harpalus*, Paris Museum, No. 3, Madagascar.

When young, this species is almost perfectly hyaline, the perithecium as well as the outer edge of the outer appendage, soon assuming a rich dark brown, abruptly contrasting color. A somewhat similar and larger form has been examined on *H. roninus* Bates from Japan, (Berlin Museum No. 1018), but is in very bad condition. The species is nearly allied to or perhaps identical with certain other forms occurring on species of *Harpalus* which have been examined from America and elsewhere, but which are in need of further study.

LABOULBENIA OPHONI Thaxter. Plate LIV, fig. 11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 190. Dec., 1899.

Perithecium free except at the base, short and stout, pale straw-yellow or nearly hyaline, variably inflated; the inner margin often strongly convex, the black tip abruptly differentiated on its inner side, black, contrasting, the lip-edges hyaline, turned slightly outward. Receptacle short, stout, normal, concolorous with the perithecium. Insertion-cell black, contrasting. The outer appendage divergent, simple or once to three times branched, the ultimate branchlets distally attenuated; the inner appendage consisting of a basal cell half as large as that of the outer, bearing a short branch on either side which may be several times branched, the antheridia borne in small groups. Spores 28 × 3 μ. Perithecia 70 × 30–34 μ. Total length to tip of perithecium 165 μ; to insertion-cell 85–100 μ; width 40 μ. Appendages, longest 200 μ.

On elytra, inferior thorax and prothorax, and abdomen of *Ophonus obscurus* Fabr., *O. brevicollis* Dej., *O. azureus* Fabr., *Harpalus neglectus* Dej., *H. serripes* Quensel, *H. sulphuripes* Germ., *H. tardus* Panz., *Dolichos flaviventris* Fabr., in Florence Museum collection of Italian Coleoptera. Paris Museum, on *Ophonus* sp., No. 37, Algeria. Berlin Museum, on *Carterus fulvipes* Sardinia.

It has not seemed possible to include this species under any of the various forms known to occur on *Harpali*, and their allies; but although the varied material is very constant and readily distinguishable, the form is a very commonplace one, without marked distinctions. Always short and stout in form, the insertion-cell, foot and perithecial tip contrasting strongly with the uniform pale transparent yellow color of the plant as a whole, the inner appendages short, hardly ever extending to the tip of the perithecium, the outer divergent with two to three tapering branches.

LABOULBENIA PALLIDA Thaxter. Plate LIV, figs. 8–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 193. Dec., 1899.

Perithecium almost wholly free from the receptacle, colorless becoming faintly yellowish, bent outward at a considerable angle to the axis of the receptacle; the prominent tip abruptly distinguished, coarse lipped, hyaline except for an inner purplish-black suffusion. Receptacle concolorous with the perithecium, the basal cell large and broad, longer than cell II, the cells of the distal portion relatively small, cell III roundish, about as large as cells IV and V together. Insertion-cell thick, contrasting purplish black. Outer appendage consisting of a basal cell, rectangular or distally enlarged and producing usually two, sometimes but one branch, the branches once or even twice branched, the ultimate branchlets sometimes very elongate and attenuated: the inner appendage consisting of a basal cell much smaller than that of the outer and sometimes lateral in position, bearing one or two branches which may be short or elongate like those of the outer appendage. Perithecia 70 × 25 μ. Total length to tip of perithecium 110–175 μ; to insertion-cell 85–120 μ. Appendages, longest 285 μ.

On the elytra of a carabid allied to *Harpalus*, Paris Museum, No. 94, Java.

This small pale species suggests *L. lepida*, but is quite distinct. The broad spreading tip of its perithecium is peculiarly differentiated, and the latter normally projects at an angle to the axis of the receptacle which is coincident with that of the appendages, as in *L. Pseudomasci*, a species otherwise quite different.

LABOULBENIA AEROGENIDII Thaxter. Plate LIV, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 155. Dec., 1899.

Form short and stout. Perithecium suffused with smoky brown, translucent, becoming distally rather abruptly subhyaline, contrasting with the abruptly differentiated tip; the latter black-brown, opaque or nearly so below, the lip-cells usually symmetrical, rounded, spreading broadly and rather abruptly, the lip-edges translucent; sometimes asymmetrical with the inner lip-cells, only, prominent and the pore external: the wall-cells with a slight spiral twist. Receptacle hyaline below, becoming more or less tinged with smoky brown above, especially cells III and IV and the region immediately below the perithecium; the suffused parts indistinctly punctate. Appendages consisting of two basal cells; the inner producing two short branches on either side, which usually bear a rather compact cluster of antheridia; the outer giving rise to from two to four branches placed antero-posteriorly with more or less regularity, the outer for the most part soon broken and deeply blackened, the rest especially the outermost more or less suffused with brown, commonly twice branched, above the basal and subbasal cells, elongate though for the most part broken. Total length to tip of perithecium 200–220 μ. Appendages 200–250 μ. Perithecium 110–120 × 35–45 μ, the apex reaching a width of 35 μ.

Along the margins of the elytra of *Ærogenidion Bedeli* Tsch., Mon-Pin (China?), Paris, No. 179.

Although closely allied to *L. filifera* and *L. intermedia*, this species is strikingly unlike any other member of the genus by reason of the remarkable conformation of the spreading tip of the perithecium, which is rendered still more prominent by its opacity. The outer branch of the outer appendage is almost invariably destroyed in mature individuals; but its form is shown in the young specimen represented in fig. 5.

LABOULBENIA INTERMEDIA Thaxter. Plate LIV, figs. 2–3.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 181. Dec., 1899.

Perithecium about three fourths free, suffused with yellowish brown deeper below the apex, rather stout, slightly inflated, the apex very broad, rounded, often almost flat, short, wholly blackened, the lips indistinguishable, the wall-cells with a slight spiral twist. Receptacle short and stout, at first hyaline below, becoming concolorous with the perithecium. Outer appendage consisting of a rather large subisodiametric cell bearing distally two or three antero-posterior branches, once or twice branched, the external branchlets brown, basally deeply blackened. Inner appendage consisting of a basal cell similar to that of the outer, and producing usually two simple or once branched branches placed antero-posteriorly, the ultimate branchlets in both appendages elongate, tapering slightly distally, hyaline. Perithecia 95–105 × 35–40 μ. Total length to tip of perithecium, average 190 μ; to insertion-cell 120 μ. Appendages, longest 300 μ.

On *Anisodactylus tricuspidatus* A. Mor., Paris Museum, No. 199, Mon-Pin, (China?). Margin of the elytra.

This species is nearly allied to *L. filifera* and *L. Ærogenidii,* representing an intermediate type between the two. The appendages are practically identical with those of the latter species, while the perithecium, though peculiar for the irregular bulging of its very blunt tip, is more like the former. The position of growth is the same in all three species and the hosts are nearly allied.

Laboulbenia obtusa Thaxter. Plate LIV, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 189. Dec., 1899.

Perithecium about three fourths free, becoming opaque, black-brown, very stout, the outer margin slightly and more or less symmetrically convex, the inner bulging prominently distally and curved abruptly to the brown blunt rounded hardly differentiated apex, the pore external. Receptacle short, cell VI together with the basal cells of the perithecium concolorous with the latter, becoming indistinguishable; cell VI extending to or towards the base of cell II, which is mostly suffused above, hyaline and contrasting below as is cell I; cells III and IV with median brown shades. Insertion-cell black-brown. Appendages hyaline becoming tinged with brown, the outer basal cell twice as long as the inner, each bearing one to two branches which form a compact group curved toward and against the perithecium. Perithecium 120 × 65 μ. Total length to tip of perithecium, average 260 μ; to insertion-cell 175 μ. Appendages, broken, 35 μ.

On *Aerogenidion Bedeli* Tsch., Paris Museum, No. 198, Mon-Pin, (China?). On left inferior margin of prothorax.

This species is most nearly related to *L. filifera* and *L. intermedia,* but differs from both in the form of its stout opaque perithecium. In perfect specimens the appendages are no doubt longer than they are represented in the figure; but probably do not attain the great length of *filifera,* as may be inferred from the fact that they are strongly curved towards the perithecium.

Laboulbenia filifera Thaxter.

Specimens apparently identical with the American material have been obtained from the Paris Collection No. 12, on *Harpalus æneus* from Selenga, Siberia; and in the British Museum No. 617 on *Pangus* sp., from Germany. The allied Chinese forms *L. obtusa, L. intermedia* and *L. Ærogenidii* have been referred to above. All of these forms occur on the margin of the elytron, near the middle and towards the base.

Laboulbenia Casnoniæ Thaxter.

This species appears to be separable from forms of *L. polyphaga* with which it might be confused, by its subconical perithecium, simple outer appendage, and more or less copiously branched inner appendage. Although it is not a well characterized species, it seems best to keep it distinct, at least provisionally. The additional material examined is as follows. British Museum, No. 500 on *Ophionea* sp., Adelaide, Australia; No. 499 on *Ophionea cyanocephala* Fabr., Daccu, India; No. 501 on *Casnonia Pennsylvanica* Linn., Ohio. Hope Collection; No. 270 on *Homothes* elegans Newm., "India," No. 276; on *Demetrias atricapillus* Linn., Morocco; No. 277 on *D. imperialis* Mey., no locality; No. 346 (bis) on *Dromius longipes* Dej., England. The type form has also been collected again by myself on *Casnonia* at Kittery Point, Maine. It should be noted that the hosts above enumerated are for the most part nearly allied.

Laboulbenia polyphaga Thaxter.

This variable form, which in its typical condition, is readily distinguished, often appears to approach so closely to *L. flagellata* and *L. Pterostichi* that, as I have mentioned in connection with these species, I am uncertain whether it should be kept distinct. It is typically small straight and stiff in habit, and rather slender; the outer appendage erect, or slightly divergent, and often quite simple, or usually but once branched near its base; the basal cell of the inner appendage bearing two short branches producing a rather compact group of incurved antheridia, which are not usually associated with any well developed sterile branches. In this respect it is not unlike some forms of *L. Anaplogenii*, although the groups of antheridia are never as dense as in this species, and cell IV of the receptacle never shows the same tendency to proliferation and division. Though normally a short form, a few which seem otherwise indistinguishable, especially from South America, are greatly elongated and very slender, measuring more than 700 μ in some cases; but such large individuals are, as a rule, readily distinguished from any of the ordinary types of *L. flagellata*. Until I can thoroughly revise and illustrate this type of which a large amount of new material has recently been obtained in South America, the forms below enumerated which have been examined since the publication of my Monograph may be provisionally assigned to this species.

British Museum: No. 614 on *Pelmatellus variipes* Bates, Pinchincha, Ecuador; No. 616 on *Bradycellus puncticollis* Coquer., Algeria; No. 681 on *Nitobia cupreola* Bates, Irazu, Costa Rica; No. 659 on *Loxandrus unistigma* Bates, Paso Antonio, Guatemala; No. 683 on *Pelmatellus nitescens* Bates, Vera Paz, Guatemala; No. 624 on *Argutor vernalis* Fabr., Europe; No. 687 on *Bradycellus circumdatus* Bates, Volcan de Chiriqui, Panama; No. 618 on *Pangus* sp., Venezuela; No. 627 on *Platysma* sp., Lake Huron, North America; No. 723 on *Stenognathus quadricollis* Chaud., Mexico; No. 685 on *Pelmatellus vexator* Bates, Totonicapam, Guatemala; No. 637 on *Tropidopterus Duponcheli* Solier, Chile; No. 623 on *Abacetus quadraticollis* Thom., Old Calabar; No. 724 on *Phlœotheratus quadricollis* Chd., Cordova, Mexico; No. 626 on *Platyderus calathoides* Dej., Tangier; No. 625 on *Argutor elongatus* Klg., Europe. Paris Museum: No. 197 on *Ærogenidion Bedeli* Tsch., Mon-Pin, China (?); No. 65 on harpaloid, Venezuela; No. 43 on *Bradycellus Lusitanicus* Dej., Lusitania; No. 111 on carabid, Celebes; No. 1a, 1b and No. 2, on Carabidæ indet., Llanos de Venezuela; No. 64 on carabid indet., Venezuela. Hope Collection: No. 325 on carabid indet., Amazon, and No. 341, Brazil. Berlin Museum: No. 1031 on *Antarctia concinna*, Lima, Peru; No. 1169 on *Lecanomerus obesulus*, Greymouth, New Zealand.

Laboulbenia Pterostichi Thaxter.

Although the type material of this species, as it occurs for example on *P. adoxus* in New England, is sufficiently well marked and easily distinguishable from the character of its appendages, the examination of varied material, which I have provisionally included under *L. flagellata* and *L. polyphaga*, lead me to believe that the present form might be more properly united with one or both of these species. Yet, as I have remarked elsewhere, if all the forms which approach perhaps too closely to *L. flagellata* were to be united under one "species," such a combination would become far too indefinite and comprehensive, and would lead to still further combinations and an ever increasing specific chaos. The South American forms that I have provisionally included here, show certain variation from the North American type, and of forms from the Eastern Hemisphere I should include, somewhat doubtfully however, material on *P. sodalicus* Heyd. from Turkestan and on *Harpalus* sp.? from Japan. It is my purpose to give this species a thorough revision in connection with its two nearest allies, as soon as I have an opportunity to study the South American material which I have recently collected. In the interim this species is retained provisionally, and in addition to the North American forms mentioned in my Monograph the following South American ones may be provisionally added. On *Pterolepta* sp., British Museum No. 629; Hope Collection; No. 336 on *Orizabus calipilatus* Columbia; No. 344 on *Pterolepta* sp. Columbia: Paris Collection No. 148 on *Pterolepta* (*Orizabus*) sp. Columbia: Berlin Museum No. 931 on *Physomerus porosus*, New Grenada.

LABOULBENIA PSEUDOMASCI Thaxter. Plate LIV, fig. 6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 196. Dec., 1899.

Perithecia dark rich brown, slightly and rather evenly inflated, relatively large divergent, free from the receptacle except at the very base; the broad opaque tip hardly differentiated, the lip-edges nearly hyaline, not prominent, turned slightly outward. Receptacle colorless or yellowish below, distally brownish, slender, its axis coincident with that of the appendages; cell I usually larger and longer than cell II, the rest of the receptacle relatively unusually small, the inner margin of cell V partly free from the perithecium. Insertion-cell free, black. Outer appendage consisting of a basal cell several times longer than it is broad, which may branch above its basal or subbasal cell one to three times successively, the branchlets divergent; the inner appendage consisting of a much shorter basal cell bearing one or rarely two branches, sometimes simple, mostly one to three times branched, all the branches becoming more or less suffused with brown. Spores about 65 × 45 μ. Perithecia 120–165 × 60 μ. Total length to tip of perithecium 225–300 μ; to insertion-cell 170–240 μ. Appendages, longest 100 μ.

On *Pseudomascus nigrita*, Fab., Paris Museum, No. 201, Mongolia. Near upper inferior margin of prothorax on left side.

This species recalls *L. umbonata* in its habit of growth, the axis of the receptacle being coincident with that of the appendages, the perithecium being laterally inserted at an angle of 45° or more, the outer appendage often unbranched, except distally, and the basal cell of the inner appendage giving rise, as a rule, to one branch only. The abrupt enlargement of cell I, immediately below cell II, and the form and contrasting coloration of the perithecium, are also characteristic.

LABOULBENIA OOPTERI Thaxter. Plate LIV, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 190. Dec., 1899.

Perithecium three fourths or more free, translucent blackish brown, the inner margin evenly curved outward, the outer margin with slight elevations at the septa and curved abruptly inward to form the well differentiated tip which is pale brownish, with dark inferior suffusions. Receptacle concolorous with the perithecium, except that cells I and II are usually hyaline, the suffused portions sparsely, rather coarsely and distinctly punctate. Insertion-cell broad and black. Basal cell of the outer appendage for the most part very long, simple or usually bearing distally an outer and an inner branch sometimes three, the former with blackened basal septum, simple, or once branched, in which case the basal septum of the outer branchlet is also blackened. Inner appendage consisting of a very small basal cell bearing a short branch on either side. Perithecia 95–110 × 30–35 μ. Total length to tip of perithecium 175–275 μ; to insertion-cell 85–160 μ. Appendage broken, 200 μ, probably much longer.

On elytra of *Oopterus rotundicollis* White, Brit. Mus. No. 613; Sharp Coll. No. 1161, on *Cyclothorax insularis*, New Zealand.

This species is distinguished by the enlargement and elongation of the basal cell of the outer appendage which may be much broadened distally, so as to become triangular in outline; and though it more commonly bears two terminal branches, as in fig. 12, and is sometimes not even once proliferous, it may become twice proliferous, so that three closely set branches arise from it in radial succession, each of which may branch above its basal cell. The outer branch is always distinguished by a black septum, and its outer branchlet is similarly distinguished and more or less distinctly edged externally with black. The figure was drawn from the material on *Oopterus*. I shall endeavor in a future publication to illustrate this species more fully from the *Cyclothorax* material which is in good condition and sufficiently abundant. The species appears to be allied to *L. bidentata* and *L. Copteæ*, but is readily separated from either.

LABOULBENIA COPTEÆ Thaxter. Plate LIV, fig. 13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 167. Dec., 1899.

Form slender. Perithecium free, except the base, nearly straight, curved outward slightly at the tip, which is blackish with hyaline lip-edges; dull translucent olive-brown, concolorous with the receptacle, or with the basal wall-cells nearly hyaline. Receptacle slender, bulging slightly at the base of the perithecium, cell II narrower distally than cell I, the base of which is hyaline. Outer appendage consisting of a basal cell several times as long as broad, hyaline, externally suffused, usually curved strongly outward, constricted distally at the deeply suffused septum, the subbasal cell abruptly narrower and shorter, usually terminated by two branchlets, the outer distinguished by a dark septum. Inner appendage consisting of a small basal cell bearing a short branch on either side, distinguished by a blackened septum, simple or once branched, usually not longer than the perithecium. Perithecium 120–140 × 35 μ. Total length to tip of perithecium 340–470 μ; to insertion-cell 220–300 μ. Appendages (longest) 400 μ.

On *Coptea armata* Lup., Brit. Mus. No. 595, Santarem, Amazon River, Brazil. On elytra and superior prothorax.

This species is readily distinguished from allied forms by the blackened septa which separate the basal cell of the inner appendage from its branches, a condition seen in no other species of the same general type. The types are in good condition and show little variation.

LABOULBENIA BIDENTATA Thaxter. Plate LIII, figs. 18–20.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 161. December, 1899.

Uniformly pale dirty brown. Perithecium rather darker, free, except at its base; somewhat inflated below, tapering symmetrically from the extremity of the basal wall-cells to the rather narrow apex; the two inner lip-cells suffused with blackish brown and projecting beyond the others to form two blunt prominences, their tips hyaline, contrasting. Receptacle rather short and stout, uniform pale dirty brown, inconspicuously striate punctate with minute somewhat darker points, the lower part of the small basal cell mostly hyaline. Outer appendage consisting of a basal cell several times as large and long as that of the inner, giving rise to an inner (lower) and an outer branch the latter distinguished by a horizontal black septum, its basal cell somewhat rounded and giving rise distally to an outer and an inner branchlet, each commonly once branched, the outer deeply blackened at the base (usually broken): the inner appendage consisting of a basal cell which bears a branch on either side which may be twice branched, hyaline, bearing solitary antheridia laterally. Spores 50 × 4 μ. Perithecia 115–130 × 45 μ. Total length to tip of perithecium 220–270 μ; to insertion-cell 135–150 μ. Greatest breadth 70 μ.

On elytra of *Homothis* sp., St. George's Sound, Australia, Hope Coll., No. 309.

Although this species appears at first sight to be a very ordinary type of the *polyphaga* group, the conformation at the tip of the symmetrically inflated perithecium, due to the peculiar form of the lip-cells is quite unlike that of any other species, and serves as an absolute distinction.

LABOULBENIA PEDICILLATA Thaxter.

Specimens of the short stout form of this species have been obtained from *Bembidium nigrum* Dej., South America, in the Berlin Museum, No. 869; and a group of individuals, which I am unable to separate specifically, was found at the tips of the elytra on a specimen of *Dyschirius thoracicus* Rossi, from Europe, in the same collection, No. 893. A figure of this form on *Dyschirius* is given on Plate LVI, fig. 11. A somewhat more elongate form was also found on *Dyschirius globosus* Herbst, from England in the Hope Collection, No. 349.

LABOULBENIA FLAGELLATA Peyritsch.

L. elongata Thaxter, Proc. Am. Acad. Arts and Sci., Vol. XXIV, p. 10, 1890.

There can I think be little doubt that the form which I have described as *L. elongata* should be referred to Peyritsch's species since, although I have as yet seen no specimens on species of *Bembidium*, the form which generally occurs on European *Anchomeni* cannot be separated from the American material. It appears to be the common type on *Anchomeni* the world over, and is subject even in its more typical conditions to very considerable variations in form, size, color and in the characters of its appendages. A comparison, moreover, with the varied material which I have included under *L. polyphaga* and *L. Pterostichi,* make me feel very doubtful whether it would not be better to unite all three forms under one protean species. Yet until I have examined more material, and especially have had an opportunity to study the large collections obtained during a recent journey in South America which are not yet available for examination, it seems best to retain these three names provisionally. What I have formerly spoken of as the "*flagellata*" type, is one about which are clustered a large number of undoubtedly distinct forms, which may occasionally, or even frequently, present variations which, in the absence of other data, could not possibly be separated from conditions of the present species. This is true for example in the case of *L. Brachini* which, in its typical condition is, however, one of the most readily recognizable species.

What the type form of *L. flagellata* really is, it is not possible to determine from the insufficient description of Peyritsch, or from the diagrammatic figures which accompany it, and it is not improbable that the form said to occur on *Bembidium* may be specifically distinct from those on *Anchomenus;* although, as far as can be determined from the figure of the former, it does not differ from the anchomenoid type.

Among the more striking forms which, from their variations toward this type, I have been reluctant to separate specifically, those occurring on *Anchomeni* (*Platynus*) in New Zealand deserve special mention. The typical forms of this race are very striking, and would be without hesitation specifically separated from the more typical conditions of *L. flagellata*: yet its variations are such that I am at present unable to separate it from certain Asiatic and South American material, and it is therefore included provisionally under the present species.

Until I am able to make an extended revision of these forms and illustrate them adequately the following additional material which has been accumulated since the publication of my Monograph may be provisionally included under the present species.

British Museum: No. 416 on *Anchomenus debilis* Woll., Canaries; No. 415 on *A. Nicholsi* Woll., Canaries; No. 634 on *Platynus alacer* Boh., Natal, Africa; No. 633 on *Antisphodrus cavicola* Schaum., Carniola, Austria; No. 632 on *A. longicollis* Boh., Carniola; No. 414 on *Calathus carinatus* Brullé, Teneriffe; No. 416 on *Argutor angularis* Br., Teneriffe; No. 631 on *Pseudopristonychus cimmerius* Steph., South Russia; No. 728 on *Coptodera Championi* Bates, Bugaba, Panama; No. 635 on *Pleurosoma sulcatum* Guer., Columbia; No. 697 on *Colpodes melanocnemis* Chd., Guatemala City, Guatemala; No. 698 on *Colpodes atratus* Chaud., Irazu, Costa Rica; No. 418 on *Dichirotrichus levistriatus* Woll., Canaries; No. 701 on *Onypterigia pusilla* Chaud., Jalapa, Mexico; No. 680 on *Notiobia luroides* Bates, British Honduras.

Florence Museum: No. (a) on *Pristonychus punctulatus* Dej., Naples; No. (d) on *Platynus albipes* Fabr., Florence ?; No. 1 on *Argutor interstinctus* Sturm., Florence: No. (m) on *Pristonychus Algerinus* Gory, Sardinia; No. (f) on *Platynus lugens* Duft., Piedmont; No. (c) on *P. dorsalis* Mull., Florence (?)

Paris Museum: No. 181 on *Antisphodrus Aeacus* Miller, Cave of Narente, Dalmatia; No. 182 on *A. Eberi* Sch., same locality; No. 182*b* on *A. cavicola* Sch., Istria; No. 131 on *Platynus*?, Sikkim, India; No. 120 on *Platynus* sp. (?) New Zealand (?); No. 123 on *Anchomenus deplanatus* White, New Zealand; No. 158 on *Notonomus variicollis* Chd., Australia; No. 195 on *Rhagodus lævipunctatus*, Pekin, China.

Berlin Museum: No. 1041 on *Colpodes ruficeps* MacLeay, Ceylon; No. 1034 on *Lipterus microcephalus* Motsch. Japan; No. 1035 on *Anchomenus validus*, New Grenada; No. 1038 on *Megalonychus* sp., Port Natal, Africa; No. 1046 on *Acanthogenius asteriscus* Hope, Hong Kong; No. 1036 on *Anchomenus oblongus* Fabr., Europe; No. 1042 on *Colpodes reflexus* Chaud., Columbia; No. 1044 on *C. atratus* Chd., Bogota, No. 1043 on *C. sulcatus* Chd., New Grenada. Sharp Collection; No. 1143 on *Antisphodrus Fairmæri* Sch., Spanish Caves; No. 1166 on *Anchomenus Faradayi* Bates, New Zealand (typical); No. 1160 on *Dichochile subopacum,* New Zealand; No. 1162 on *Anchomenus Otagoensis* Bates, New Zealand; No. 1163 on *A. montivagus* Bates; N. Zealand; No. 1164 on *A. latipennis,* Aukland, N. Z.; No. 1165 on *A. Helusi* Sharp, Greymouth, N. Z.

Hope Collection; No. 275 on *Onypterygia purpuratus* Bogota; No. 352 on *Stomis punicatus* Pz., England, No. 351 (a) on *Platynus* "*lævis* Mull.," England; No. 351 (b) *P. dorsalis* Mull., England; No. 351 (c) on *P. dorsalis* Müll., Italy. No. 351 (d) on *P. oblongus* Fab., Italy; No. 313 ? *Diorichodorus*, "N. H."

Laboulbenia parvula Thaxter.

Specimens apparently belonging to this species were found on *Pelmatellus obtusus* Bates Brit. Mus. No. 684. Ostuacan, (?), Mexico.

Laboulbenia Tænodemæ Thaxter. Plate LVIII, fig. 13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 204. Dec., 1899.

Perithecium nearly free, slightly inflated, clear translucent brown; the tip well differentiated, externally black with an inner inferior hyaline patch, the lips well distinguished hyaline, the inner very prominent, rounded, the pore external. Receptacle long and slender through the elongation of cell II, pale dirty yellowish brown or nearly hyaline. Insertion-cell large, free, blackish, slightly narrower than cells IV + V. Appendages concolorous with the receptacle, the outer consisting of a large basal cell which bears distally as a rule two antero-posterior branches; the inner simple, the outer furcate above its basal cell; the branches stout, slightly tapering, elongate, the inner erect, the outer divergent; its branchlets curving upward: the inner appendage consisting of a much smaller basal cell, rounded and bearing one or two short branchlets. Spores about 70 × 5 μ. Perithecia 125–155 × 35–50 μ. Total length to tip of perithecium 400–650 μ; to insertion-cell 300–400 μ. Appendages, longest about 600 μ.

On the elytra and superior prothorax of *Tænodema* sp., Brit. Mus. No. 391 and Sharp Coll. No. 1152 on *T. cinerea* Sharp, Ega, Amazon.

Thirty individuals of this species which have been examined vary very slightly, and for the most part only in size, the appendages being constant in their characters as represented in fig. 13. The perithecium is practically free and almost symmetrically inflated. The tip almost neck-like, the black and hyaline parts sharply contrasting. I was at first inclined to consider this one of the many varieties, perhaps better assembled under one name, which are included in *L. flagellata* and *L. Pterostichi*; but further comparison leads me to believe that it should be kept distinct. The hosts belong to a remarkable and very beautiful genus of large tree living Staphylinidæ inhabiting tropical South America.

Laboulbenia uncinata Thaxter. Plate LXI, fig. 13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 208. Dec., 1899.

Pale yellowish, becoming tinged with pale reddish yellow. Perithecium more than one half free, relatively large, stout, nearly oblong, the black tip recurved externally through the rounded upgrowth of the inner distal portion of the perithecium which makes them almost lateral in position, the right lateral lip-cell often twice as long as the others and more prominently recurved, its projecting portion the branchlets short, translucent, rounded. Receptacle medium, normal. Appendages normal, rather short, several times branched, the cells rather short stiff, divergent and somewhat tapering. Spores 50 × 3.5 μ. Perithecium (not including lip-cells) 120 × 62 μ. Total length to tip of perithecium 100–120 μ; to insertion-cell 72–92 μ. Appendages (longest) 40 μ.

At base of anterior legs of *Harpalus æneus* Fabr., Selenga, Siberia, Paris Mus. No. 12, and of *Harpalus viridiæneus* Beauv., Cape Neddock, Maine, collected by Mr. Charles Bullard.

This species is well distinguished from *L. macrotheca*, to which it seems to be more nearly related, by the repeated branching of its short stiff tapering divergent branches, and by the peculiar modification of its lip-cells, which is exactly the same both in the Siberian and American material. The accompanying figure is drawn from specimens obtained by Mr. Bullard from a species of *Harpalus* the determination of which as given above is not certain.

LABOULBENIA MACROTHECA Thaxter.

Typical specimens of this form were found in the Paris Museum No. 13; on *Anisodactylus* (or *Harpalus ?*) from Selenga, Siberia. On *Harpalus viridiæneus* Beauv., Bathurst, N. B. (Dr. Richards). The Siberian and American specimens of this coarse tipped, straw yellow form are identical and indicate that it is a species of constant characters.

LABOULBENIA PLATYPROSOPI Thaxter. Plate LV, fig. 6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 51. June, 1902.

Uniform transparent pale reddish amber, the cell-walls very thick. Perithecium straight, wholly or nearly free, erect, the margins slightly convex; of nearly equal diameter throughout to the rather abruptly differentiated short erect blackish tip; the hyaline lip-edges outwardly oblique: the base sometimes abruptly broader than the ascigerous portion. Cells I–VI of the receptacle not differing very greatly in length, except cell V, which is relatively large; cells III and VI paired; cell IV prominent externally below the thin contrasting distinctly reddish insertion-cell. The appendages quite hyaline, the basal cell of the outer several times larger than that of the inner, and bearing two to four branches in an antero-posterior series; the basal cells of which usually bear each a pair of branchlets in the same plane: the small basal cell of the inner appendage producing a branch on either side bearing branchlets similar to those of the outer appendage; the antheridia crowded on special branchlets, curved hyaline, small and closely appressed. Spores about 55 × 5 μ. Perithecia 150–185 × 36–45 μ. Receptacle 150–220 × 60–70 μ. Appendages, longest, 360 μ. Total length to tip of perithecium, 275–350 μ.

On the elytra and abdomen of *Platyprosopus Beduinus* Nordm.; Berlin Museum, No. 810; Nubia.

This pale form was found in numbers and in good condition on the large Staphylinid above mentioned. Though it possesses no very marked individuality, it is easily distinguished by its relatively short and broad receptacle, cells III and VI of which are almost equal, though cell III may be slightly the longer of the two. The perithecium, which is usually straight and relatively long, is often set on the receptacle a little within the external margin and, as in *L. Anaplogenii*, the insertion-cell has a characteristic red-brown or claret-colored tint.

LABOULBENIA ANCHONODERI Thaxter. Plate LV, figs. 10–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 156. Dec., 1899.

Pale amber-yellow, perithecium slightly darker, about two thirds free, the inner lip-cells suffused below with blackish brown, an external prominence involves the upper portion of the subbasal and lower portions of the subterminal wall-cells, forming, in the specimens from *A. subæneus*, an abruptly defined hunch. Receptacle normal, the basal and subbasal cells usually slender and somewhat darker, the subbasal more distinctly marked with fine transverse striations which are less distinct on the cells above it. Appendages concolorous, the outer simple (always?), the inner consisting of a basal cell similar to that of the outer, about twice as long as broad, giving rise on either side to a single branch which may be once branched above its basal cell; all the branches somewhat flexed. Insertion-cell red-brown or purplish, more or less oblique through the upgrowth of cell V. Spores about 45–48 μ. Perithecia (larger) 185 × 48 μ, average 125 × 48 μ. Total length to tip of perithecium 275–500 μ (longest 535 μ). Appendages about 200 μ.

On the elytra of *Anchonoderus subæneus* Reiche, San Felix, Panama, and *A. binotatus* Reiche, Guatemala City, Brit. Mus. (Biologia coll.), Nos. 706 and 707. On *A. pallipes* Reich., New Grenada, Berlin Museum No. 1026, var. on *A. rugosus* Dej., Columbia, Berlin Museum No. 1025.

Although this species is subject to considerable variation, it is usually easily recognizable by its reddish to claret-colored insertion-cell, which is carried out free from the perithecium, as a rule, by the enlargement of cell V. The subterminal external, often somewhat angular, hunch of the perithecium is sometimes wholly absent, but is usually well marked. A variety on *A. rugosus* (Berlin Museum No. 1025) has the subbasal cell of the outer appendage suffused with deep red brown. The material on *A. subæneus* is taken as the type.

Laboulbenia Anaplogenii Thaxter. Plate LV, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 156. Dec., 1899.

Perithecium nearly hyaline or pale yellowish, becoming tinged with pale amber-brown, stout, free except at its base, the outer margin mostly straight, the inner convex; the tip rather small and abruptly distinguished, blackish except the hyaline lip-margins. Receptacle concolorous with the perithecium, rather short and stout, cell V relatively large, cell IV divided by transverse septa into from two to several superposed cells, usually extending upward beyond the insertion-cell, thus forming a blunt outgrowth external to it. Insertion-cell red-brown to claret-colored. Basal cells of the appendages nearly equal, each producing as a rule two similar branches antero-posteriorly, once or twice branched in the same plane, the branchlets rather elongate and slender, concolorous with the receptacle. Perithecium 140–155 × 50–55 μ. Spores 50 × 4.5 μ. Total length to tip of perithecium 300–400 μ, to insertion-cell 200–240 μ, greatest width 50–70 μ. Appendages, longest 600 μ, average 300 μ.

On the elytra of *Anaplogenius circumcinctus* Moh., Brit. Mus. Nos. 622 and 665, China: on *Abacetus costatus* Ceylon; Berlin Museum No. 903: *A. rubripes*, ? France, Berlin Museum No. 905; *Abacetus* sp. Bengal, Berlin Museum No. 904; on *Agonoderus pallipes* Fabr., New England. *Stenolophus fuliginosus* Dej., Cambridge, Mass. Also immature material of apparently the same species on an undetermined Carabid, Paris Museum, No. 4, from Madagascar.

Allide to *L. polyphaga*, but distinguished by its pale yellow color and the tendency of cell IV to become septate and proliferous. Many specimens occur, however, in which the receptacle is normal. The antheridia are often greatly multiplied; but the numerous antheridial branches may be replaced, especially in the Asiatic material, by numerous elongate sterile branches. No. 665, on *Anaplogenius* from China, has been taken as the type (fig. 4). A remarkably well developed form from the Cambridge region is represented in fig. 5. The species resembles *L. Anchonoderi* and *L. Platyprosopi* in having a red insertion-cell.

Laboulbenia verrucosa Thaxter. Plate LVI, fig. 16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 209. Dec., 1899.

Perithecium becoming deeply suffused with smoky brown, straight, the line of demarcation between the subterminal and subbasal wall-cells indicated by a more or less well defined ridge forming a rather prominent external hunch in this region, above which the perithecium is abruptly contracted, almost at right angles in the type, below the rather narrow nearly erect tip, the lip-cells black below, with the broadly hyaline edges turned obliquely outward. Receptacle dirty yellow-brown, becoming more or less suffused with smoky brown, especially the two basal cells, and covered with irregular wart-like prominences which are more or less definitely arranged in transverse rows. Appendages of ordinary type, the outer once to twice branched, the inner consisting of a smaller basal cell giving rise on either side to single branches which may be from once to three times branched; all the branches divergent, pale dirty yellowish with brown shades above the lower septa. Perithecia 150–170 × 45–50 μ. Total length to tip of perithecium 550–610 μ; to insertion-cell 430–480 μ. Appendages (longest) 400 μ.

On the elytra of a carabid allied to *Platynus*, Hope Coll. No. 342 (without label) and U. S. Nat. Museum, No. 7, Mt. Coffee, Liberia, Africa.

The specimens from Mt. Coffee are paler than those from the Hope Collection, the perithecium being concolorous with the dirty amber receptacle, the subterminal ridge and external hunch alone being darker colored. The species is nearly allied to some large forms of *L. flagellata*. Its corrugated surface recalls *L. notata*, but the two are not nearly allied.

Laboulbenia spiralis Thaxter. Plate LVIII, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 202. Dec., 1899.

Perithecium one half to one third (sometimes only the tip), free from the receptacle, dark dull amber-brown with dirty brown suffusions, rather stout, the tip moderately well distinguished, rather short and stout, deep black-brown, except the distal hyaline lip-edges. Distal portion of the receptacle concolorous with the perithecium; cells I and II much paler; cell I longer than cell II, the two forming a rather slender stalk of about the same diameter throughout, above which the distal portion of the receptacle is somewhat abruptly distinguished; the lighter portions marked by fine transverse striations not visible in the deeply colored often opaque distal region. Outer appendage consisting of a main straight divergent axis formed by usually three nearly equal cells, deeply blackened externally, bearing distally and from each of their upper inner angles, a very long slender erect simple branch, which is reddish brown, paler and spirally twisted distally. The inner appendage consisting of a basal cell about as large as that of the outer appendage and bearing on either side a branch which may give rise to one or two erect simple branchlets similar to the branches of the outer appendage. Perithecia about 150 × 55 μ. Total length to tip of perithecium 300–390 μ; to insertion-cell 275–325 μ. Appendages, longest 480–610 μ.

On *Hexagonia* sp. ?, Hope Coll., No. 288, Ceylon (Thwaites) on *Helluodes Nebrioides* Nietn., Berlin Museum, No. 1050, Ceylon.

This species appears to suggest a transitional type between *L. flagellata*, or some of its forms, and *L. Helluodis* which it approaches in the character of its appendages. The branches of the latter are remarkably developed, and although in the material from *Helluodes* they are mostly broken, the spiral twist of the extremities seems characteristic of this as well as of the type material, supposed to have occurred on *Hexagonia*, although the determination in the last instance was uncertain.

Laboulbenia Ceylonensis Thaxter. Plate LVIII, figs. 9–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 164. Dec., 1899.

Perithecium wholly free, suffused with smoky brown, relatively short and small, straight, hardly inflated, somewhat abruptly contracted distally to form the unusually large broad tip, the distal half of which is hyaline, distinguished from the opaque black lower half by a clean cut line of demarcation: the basal cells forming a short stout hyaline neck narrower than the body of the perithecium. Receptacle elongate, of nearly the same diameter throughout, the basal cell nearly hyaline, the cells above it more or less deeply suffused with smoky brown, cell V and the upper portion of cells IV and VII hyaline, the distal suffused portion obscurely punctate. Outer appendage consisting of a basal cell deeply blackened externally (the blackened area continuous with the black insertion-cell and involving also the external walls of the two cells immediately above it) producing from one to three branches arranged antero-posteriorly, which may be once or twice branched in a similar fashion, the branchlets long, slender, drooping, hyaline, some of the lower cells suffused with reddish brown: the inner appendage consisting of a basal cell about half as large as that of the outer, producing in the types a single branch which may be once branched as in the outer. Perithecium 105 × 32 μ. Total length to tip of perithecium 445 μ; to insertion-cell 320 μ. Greatest breadth 42 μ. Appendages 340 μ.

On *Hexagonia* ?, Ceylon, Hope Coll. No. 288. On elytra.

This singular species, which belongs to the group in which *L. Helluodis*, *L. spiralis* and *L. Planetis* are associated, is remarkable for its relatively very small perithecium, which is combined with a large elongate, almost isodiametric receptacle. The four types examined are in moderately good condition and show no essential variations.

Laboulbenia flaccida Thaxter. Plate LVIII, fig. 5.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 37. June, 1902.

Perithecium free except at its base, brown, straight, slightly inflated below, tapering evenly to the broad blunt apex; the tip scarcely if at all distinguished, marked by darker shades; the lips coarse, forming slight irregular projections. Receptacle yellowish or nearly hyaline, becoming slightly tinged with brownish and faintly punctate above the basal cell, which, as well as the subbasal, is relatively large, the two subequal, usually more or less abruptly distinguished from the broader compact portion, the cells of which are relatively small, the upper half or less of cell IV free, projecting externally to the insertion cell, which is rather small and thick; deep, slightly reddish, brown, the deep suffusion continuous with a corresponding external coloration of the basal cell of the outer appendage and the three to four lower cells of the outer branch, which arises from it and which curves more or less strongly outward; the distal portion curved upward, hyaline, tapering, flaccid, each of the suffused cells giving rise distally, from the inner side, to a more or less erect, simple (or the lower sometimes furcate) hyaline branchlet, the lower cells of which are rather long and slender, inflated; the distal portion tapering, thin-walled, usually becoming flaccid; the inner branch of the appendage furcate above its erect basal cell, the branchlets divergent and similar to those of the outer branch, or short and bearing antheridia usually in pairs; the inner appendage consisting of a basal cell about as large as the outer, bearing a hyaline branch on either side which is usually furcate above its basal cell, the branchlets similar to those of the outer appendage. Spores about 40 × 4 μ. Perithecia 80–90 × 25–30 μ. Receptacle 90–125 μ. Appendages 150–200 μ. Total length to tip of perithecium 175–220 μ.

On legs of *Casnonia subdistincta* Chaud.; British Museum, Biologia Collection, No. 704. (Mexico ?)

This species is in some respects not unlike *L. Casnoniæ*. Its appendages, however, belong to the type illustrated by *L. Planetis* and *L. Helluodis*, and easily distinguish it from any of the forms of *L. polyphaga*, or of other species with which it might possibly be confused.

LABOULBENIA STOMONAXI Thaxter. Plate LIV, fig. 16–17.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 54. June, 1902.

Perithecium hyaline, becoming tinged with brown, less than one half free; short, the outer margin nearly straight, bending rather abruptly inward at the tip; the inner margin converging to the apex from its point of union with cell V; the tip rather abruptly distinguished, broad; the apex nearly flat, the lips hardly prominent. Receptacle yellowish or hyaline, with faint brownish shades; the basal cell usually bent, the subbasal with deeper brown suffusions; cell III more or less deeply suffused with brown, its thick outer wall opaque or nearly so; cells III and IV subequal, several times longer than broad; cell V long-triangular. Insertion-cell thick, black, contrasting, wholly free, separated from the perithecium by nearly the whole upper margin of cell V. Outer appendage curved strongly outward, hyaline on its inner side, deeply suffused on the outer concave side, the suffusion continuous with the insertion-cell; consisting of a small number of cells, the basal relatively long, the rest producing suberect hyaline branchlets distally on the upper side: basal cell of the inner appendage smaller, the subbasal cell usually bearing two branchlets. Spores 50 × 5 μ. Perithecia 65 × 25 μ. Receptacle 100–110 μ. Appendages 50–75 μ approximately. Total length to tip of perithecium 130–140.

On the margin of the left elytron of *Stomonaxus* sp., Java; Paris Museum, No. 93.

In the types of this small and peculiar species, the appendages are more or less broken, even in the youngest specimens. It is distinguished by the conformation of the distal portion of the receptacle, and the deep lateral suffusion of the latter, as well as by the entire absence of suffusions even at the tip of its perithecium. The spores are large for so small a form, nearly equalling the perithecium in length. It does not appear to be nearly related to any other described species.

LABOULBENIA HELLUODIS Thaxter. Plate LVIII, figs. 11–12.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 41. June, 1902.

Perithecium becoming rich brown, free, usually somewhat broader distally, slightly inflated; the basal-cells forming a clearly defined, somewhat constricted, short neck; the tip abruptly distinguished, went very slightly outward, opaque except the broadly hyaline or subhyaline, broadly rounded lips. Basal cell of receptacle hyaline or subhyaline, inflated, broader than, and contrasting with, the opaque subbasal cell, which is of about equal length and forms a constricted region; the distal portion of the receptacle small, rather abruptly broader, sub-triangular, the external margins even; cells III, IV and VI subequal, more or less deeply suffused with brown; cells III and IV more deeply suffused externally, about half the upper margin of cell IV free and forming a distinct prominence external to the jet black insertion cell; cell V small and roundish, the dark portions indistinctly punctate. Outer appendage consisting of a divergent main axis of three cells, broadly and deeply blackened externally and at the septa; the two lower bearing a single, usually simple, divergent branch distally from the inner side; the upper bearing two such branches terminally, the outer deeply suffused with blackish brown, especially toward its base, and directly continuous with the suffused portion of the main axis; the basal cell of the inner appendage half as large as that of the outer, giving rise to a rather short simple branch on either side, or often itself simple, bearing one or two solitary antheridia near its base. Spores about 85 × 5 μ. Perithecia 150–165 × 40–55 μ including the stalk (20 μ). Receptacle 185–220 × 60 μ. Longest appendages 290 μ. Total length to tip of perithecium 360 μ.

On *Helluodes Nebrioides* Nietn., Ceylon; Berlin Museum, No. 1050.

This striking species seems most nearly related to *L. Ceylonensis*, *L. spiralis* and *L. Planetis*, the appendages of which are very similar. Its typical form illustrated in fig. 11, is very clearly distinguished by its free perithecium, and the peculiar conformation and coloration of the receptacle. The types were associated with a few mostly broken specimens of *L. spiralis* which, however, is distinguished from it by the form and coloration of the perithecium and receptacle, and the relation which the former bears to the latter.

Laboulbenia Planetis Thaxter. Plate LVIII, fig. 6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 50. June, 1902.

Perithecium large and stout, clear transparent brown, except the subhyaline base, which is separated by a more or less clean-cut line of demarcation; the wall-cells with a slightly spiral twist, the tip abruptly distinguished, symmetrical or nearly so, black, except the evenly rounded subhyaline symmetrical lip-edges. Receptacle rather slender, subhyaline with pale brownish shades; cell II twice as long as the basal cell; cell IV bulging rather prominently externally and more deeply suffused with brown. The insertion-cell deep black, broad, thick. The appendages erect, their branches curved toward the perithecium: outer appendage normally consisting of a main axis of three superposed cells, externally broadly blackened, the blackening involving the septa and adjacent external portions of the cells; the distal cell bearing three branches; an outer and an inner simple, and a median one, once branched, the outer deeply suffused about its base, which forms a direct continuation of the suffused external area of the main axis; the remaining cells each producing a usually simple branch distally on its inner side; all the branches long, slender, distally thin-walled and hyaline, curved toward the perithecium, the lower somewhat constricted, and more or less deeply suffused at the lower septa: basal cell of the inner appendage half as large as that of the outer, bearing a branch on either side, from the basal cells of which arise often two branchlets, similar to those of the outer appendage. Spores 65 × 5 μ. Perithecia 155–165 × 55–60 μ. Receptacle 290 μ. Appendages 360–435 μ. Total length to tip of perithecium 400–425 μ.

On the thorax of *Planetes bimaculatus* MacLeay, Java; Berlin Museum, No. 1047.

A beautiful species, closely allied to *L. Helluodis*, but having a very different receptacle and perithecium. Three specimens, only, have been examined, two of which are in nearly perfect condition.

Laboulbenia Rougetii Robin.

L. Europæa Thaxter.

It seems quite certain that what I previously described as *L. Europæa* is in reality the species figured by Robin, although the plates are quite misleading, apparently representing individuals in which the appendages have become more or less abnormal through injury. So large a number of European *Brachini* have been examined, however, on which *L.* "*Europaea*" is the common species, that there seems no question as to the correctness of the reference.

The typical form, as it occurs on *Brachinus*, and also on *Aptinus*, *Leistus* and *Chlænius*, is distinguished by its almost obconical receptacle, which is relatively broad distally; the form of the perithecium, which normally tapers very evenly from its base to the blunt apex, the outer and inner margins often nearly straight; the character of the outer appendage, which is more or less deeply suffused toward the base and from the basal or subbasal cells of which, sometimes from both, arise simple, more or less rigid branches of variable length, tapering and rather slender; the normal color of the receptacle and perithecium is a characteristic red amber-brown, which may often be obscured by smoky brown shades. Some South African and Madagascar specimens are uniformly pale yellowish, sometimes without any suffusions, even in the appendages, and closely resemble the simple types of *L. Brachini* which replaces *L. Rougetii* on these hosts in the western hemisphere.

Two varieties on *Brachini* from the Orient are distinguished below. Exclusive of these, the material examined of this species is as follows: Paris Museum No. 30 on *Brachinus* sp., Algeria; No. 35 on *Chlænius æneocephalus* Dej., Algeria; No. 61 on *Brachinus nigricornis* Gebl., Asia; No. 62 on *Brachinus* sp., Africa; No. 129 on *Brachinus* sp., Turkestan; No. 196 on *Chlænius gracilicollis*, Turkestan (also from British Museum No. 596). British Museum No. 532 on *Aptinus* sp., Port Natal, Africa; No. 538 on *B. exhalans* Rossi, Athens, Greece; No. 542 on *Brachinus* sp., Cape of Good Hope. Hope Collection No. 242 on *Aptinus Italicus*, Rome; No. 243 on *A. Boeticus*. Andalusia, Spain; No. 246 on *A. displosor* Dufour, Spain; No. 251 on *B. angustatus* Dej., Morocco; No. 326 on *Chlænius Mediterraneus*; No. 327 on *Leistus præustus* Fabr. = *rufescens* Fabr. (no locality); No. 347 on *B. crepitans* Linn., England: Berlin Museum No. 979 on *B. humeralis* Ahr., France; No. 984 on *B. gentilis* Erichs., Angola, Africa; No. 986 on *B. Bayardi* Dej., Bagdad; No. 987 on *B. bipustulatus* Quens., Caucasus; No. 988 on *B. cyanipennis*, and No. 989 on *B. ruficeps* Fabr., Cape of Good Hope.

The following varieties occurring on the larger oriental species of *Brachini* may be distinguished.

Var. **Chinensis** nov. var. This form which is common on various oriental species of *Brachinus*, is distinguished by its large size, 450 μ to the tip of its perithecium, and the luxuriant development of its several times divaricately branched appendages which may measure more than 450 μ. The general color and form of the receptacle are as in the type, the perithecium more distinctly inflated as shown in fig. 8, Plate LV, which is much reduced.

On *B. Chinensis* Chaud., British Museum 536, China; Hope Collection, No. 244, Hong Kong; Paris Collection No. 59 Macao, China; Berlin Museum No. 997, Hong Kong. On *Brachinus* sp. British Museum No. 539, China.

Var. **Japanensis** nov. var. This is a large form, the largest specimens measuring 700 μ to the tip of the perithecium, and is distinguished by the very stout outwardly curved relatively short appendages, which are closely branched at and near the base; the whole basal region becoming black and opaque in some specimens, a condition not marked in the individual illustrated in Plate LV, fig. 7. The general color is as in the type, the perithecium somewhat inflated and relatively small. The twenty-five specimens of various ages that have been examined are constant and readily separable from any other forms of *L. Rougetii*. In a few individuals the dense branching of the appendages gives an appearance very similar to that seen in certain forms of *L. Brachini*. The branches do not, however, result from a repeated proliferation of the basal cells, the characteristic oblique black septa are absent, and the antheridia are of a different type.

On *Brachinus* sp., Japan, Sharp Collection, No. 1188.

The species is thus similar on the one hand to *L. flagellata* and its near relatives, and on the other to *L. Brachini* through the var. *Japanensis*.

LABOULBENIA BILABIATA Thaxter. Plate LV, fig. 9.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 315. July, 1905.

Form stout, the basal cell of the receptacle nearly hyaline, the subbasal becoming amber-yellow, the parts above it clear amber-brown. Perithecium stout, nearly symmetrical, tapering to the broad tip, the anterior lip-cells modified subterminally to form a closely approximated pair of broadly rounded projections, which are subtended on the inner side by the slightly prominent rounded apex, which is in turn subtended by a blackish suffusion of no great size. Receptacle normal, rather short and stout, the basal and subbasal cells slightly prominent anteriorly, of nearly equal length, the walls very thick and striate. Appendages normal, the outer consisting of a black-brown basal cell, twice as long as broad, bearing distally the two divergent branches, which are mostly once branched (antero-posteriorly), all the lower cells suffused with brown, becoming hyaline toward the tips: the inner appendage consisting of a basal cell, slightly shorter than that of the outer, paler brown, bearing the normal branch on either side; the branchlets more or less elongate, or bearing loose tufts of antheridia. Perithecium 240 × 75 μ, including the terminal projections, which measure 25 × 22 μ. Receptacle 225–250 μ. Total length 450 × 115 μ. Appendage 200–300 μ.

On *Brachinus armiger* Dej., Cape of Good Hope; Berlin Museum, No. 982.

This species is closely allied to *L. Rougetii*, being similar in color and having the same appendages; but differs in the subterminal outgrowth at the tips of the perithecium which renders the pore lateral on the inner side.

Laboulbenia dubia Thaxter. Plate LV, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 35. June, 1902.

Perithecium dark brown, rather long, mostly straight externally, the tip small, usually abruptly distinguished; the lips outwardly oblique, the blackish inner lip-cell more prominently rounded and subtended by a slight, usually distinct rounded elevation especially on the inner side, which gives the tip a characteristic outline; the body dark translucent brown, wholly free. The receptacle very thick-walled, pale dirty brownish yellow, deeper distally. The basal cells of the appendages subequal, the outer bearing two branches radially, which are simple, or the inner once branched above its subbasal cell; the antheridia borne singly at the lower septa or on short branchlets: all the ultimate branches of both appendages, about six, relatively stout, erect, rather closely septate, about six- to eight-celled, curved slightly outward, tapering to the blunt extremities, which but slightly exceed the apex of the perithecium. Spores 55 × 5 μ. Perithecia 165–185 × 55–65 μ. Receptacle 220–325 × 75 μ. Longer appendages 220 μ. Total length to tip of perithecium 440–500 μ.

On the abdomen of *Philonthus politus* Linn., Alverstoke, England; British Museum, No. 363.

With the exception of a few immature individuals on *Philonthus punctus* Grav. from Europe (British Museum No. 427) which may belong to this species, no other form on the thousands of *Philonthi* which I have examined, has been found which at all resembles the present one. It is perhaps too near *L. rigida*, but differs in its copious appendages and in the often pronounced subterminal enlargement of the perithecium. One other species of *Laboulbenia* has been seen on *Philonthus* (exclusive of *Cafius* on which *L. Cafii* and a second undetermined form are known to occur) which is represented by a single immature specimen from *P. decorus* Grav. in the British Museum, No. 423, Heidelberg; but this species, with its very copiously branched appendages, which recall those of *L. Brachini*, is entirely different from the present form.

Laboulbenia Latonæ Thaxter. Plate LVI, figs. 3–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 45. June, 1902.

Perithecium usually deep brown, nearly opaque, the tip large rather coarse lipped, free from the receptacle. The receptacle normal often greatly elongated through the development of cell II, insertion-cell borne free from the receptacle by the elongation of cells IV and V. The outer appendage consisting of a large, broad, subhyaline basal cell, which gives rise to two, often three, or rarely more, branches in a crest-like radial series, their basal cells small squarish subhyaline; producing, as a rule, a pair of greatly elongated simple deep rich brown flexuous tapering branchlets; the basal cell of the inner appendage giving rise in general to a branch on either side, one of which resembles the branches of the outer appendage, and gives rise to long slender brown branchlets; the other commonly short, and bearing one or two antheridial branchlets; the small straight antheridia borne in compact groups of two to four members.

Spores 70 × 5 μ. Perithecia 175–220 × 60 μ. Longest appendages 1150 μ, the average 750 μ. Total length to tip of perithecium 325–1125 μ.

On all parts of *Latona Spinolæ* Guér., Bogota, Berlin Museum, No. 834.

This species, which varies considerably in size, is well distinguished by its crest-like appendages, which recall those of *L. cristata,* the very long stiff deep red-brown ultimate branchlets of which are very similar in general appearance. The type of branching is however quite different, and the species is perhaps more nearly allied to *L. Quedii* which is still only known through the Type figured in my Monograph.

LABOULBENIA OEDICHIRI Thaxter. Plate LXI, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 48. June, 1902.

Tinged with smoky brown. Perithecia falcate, strongly bent toward the appendages, pale smoky brown, tapering symmetrically, or nearly so, to the base and apex; the basal cells forming a short narrow hyaline stalk; the tip not differentiated, suffused with deep blackish brown, except the pale or hyaline blunt apex, the outer lips most prominent. Receptacle more or less distinctly punctate, relatively long and of nearly equal diameter throughout, often slightly geniculate through an enlargement of the basal cell, which is relatively very large just below the subbasal cell, which is smaller and separated by a more or less oblique septum; cell III relatively small, distally more prominent on the inner side; cells IV and V very small, nearly equal; cells III and VI subequal. The insertion-cell small, rather thick, wholly free and separated from the stalk of the perithecium by about half the width of cell V. The basal cell of the outer appendage larger, sometimes inflated, bearing distally, as a rule, one terminal and two lateral branches which are usually simple, distally hyaline, somewhat constricted at the septa, hardly reaching to the tip of the perithecium; basal cell of the inner appendage very small, circular in outline, bearing apparently three branches like the outer. Spores 55 × 5.5 μ. Perithecia 125 × 32 μ. Receptacle 150 × 30 μ. Appendages about 90 μ. Total length to tip of perithecium about 250 μ.

On the elytra and upper surface of the abdomen of *Oedichirus* nov. sp.; Sharp Collection, No. 1154; Rio de Janeiro, Brazil.

The curious form of the perithecium in this species which is inflated above its narrow hyaline neck, and its peculiar receptacle, the distal part of which is relatively greatly reduced, serve to distinguish it very clearly. Cells IV and V are very small and nearly equal, while cell I is relatively large, larger and broader than cell II, and punctate where it is suffused. The host is a staphylinid, one of the Pæderini, but the parasite does not appear to be nearly related to *L. cristata*, or to any other described species.

LABOULBENIA CRISTATA Thaxter.

Although the species of *Pæderus* are so numerous and at the same time so varied and peculiar, this single species of *Laboulbenia,* which occurs on them all over the world, does not appear to be subject to any considerable variation except in the number of branches which compose the crest-like group of appendages; and even this variation is not associated either with particular regions, or special hosts. Further material has been obtained from the Berlin Collection No. 838 on *P. longipennis* Erichs., Sicily; No. 839, on *P. coarctatus* Erichs., Brazil; No. 840 on *P. duplex* Epp., "Arussi Calla.," N. W. Africa; in the Sharp Collection; No. 1153 on *P. rutilicornis* Er., Columbia: in the British Museum; No. 763 on *P. luridiventris,* Sharp, Volcan de Chiriqui; No. 388 on *Pæderus* sp., Java; No. 389 on *P. australis* Guer., Australia, No. 764 on *P. erythroderus* Erich., Cordova, Mexico: in the Paris Museum No. 204 on *P. furcipes* Curtis, Muscata, India; No. 180 on *Pæderus* sp. Venezuela: in the Hope Collection No. 219, on an East Indian *Pæderus* collected by Wallace, labeled "Bac. 38."

LABOULBENIA DIOPSIS Thaxter.

Additional specimens of this well marked species were found in the Berlin Museum on *Diopsis tenuipes* Westw. No. 862, Bondie, Africa and on *Diopsis* sp. No. 857, Togo, West Africa, and in the British

Museum on *Diopsis* sp. from East Africa No. 738. In the last mentioned specimens the tips of the appendages are characteristically helicoid, being curved downward instead of upward, as is more often the case. In the material on *Diopsis tenuipes* some of the specimens are very elongate, nearly a millimeter to the tip of the perithecium, and the rather rigid appendages project nearly at right angles to the axis of the receptacle. The species is curiously near to *L. cristata*, but is very well marked and distinct.

Laboulbenia falcata Thaxter. Plate LXV, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 175. Dec., 1899.

Perithecium free or nearly so, mostly very large, pale yellowish, the inner half or more suffused with smoky brown, darker toward the margin, the base more or less strongly curved so that the perithecium is directed outward nearly at right angles to the axis of the receptacle or even recurved, basally inflated along the inner margin, tapering gradually from about the lower third to the apex; the tip not differentiated from the body of the perithecium, the lip-cells with darker longitudinal brown shades the outer more prominent, hyaline, notched; the inner rounded, brownish. Receptacle short, straight or nearly so, the basal cell broad, sometimes slightly inflated, a slight constriction often present between cells II and III, all the remaining cells unusually small in proportion. Outer appendage consisting of a small rounded basal cell bearing a single branch separated from it by a blackened constricted septum and consisting of a hyaline externally blackened basal cell bearing two branchlets; an outer externally blackened and bearing several vertical branchlets; an inner usually simple, hyaline or yellowish. Inner appendage consisting of a basal cell similar to that of the outer or slightly smaller, producing a branch on either side, each usually branched, all the branches pale yellowish with occasional brown suffusions, the longest not greatly exceeding the tip of the perithecium. Spores 35 × 3 μ. Perithecium 150–200 × 35–55 μ. Total length to tip of perithecium 275–380 μ; to insertion-cell 140–190 μ. Width 34–40 μ. Appendages 175–275 μ.

At the base of elytra and on superior prothorax of *Casnonia* sp., Paris Mus. No. 116 *bis*, Bahia, Brazil.

A well marked species, chiefly peculiar for the large size and unusual form of its perithecium, which is twisted so that the inner and outer lip-cells are lateral in position. The outer lip-cells project slightly above the inner, and form a characteristic sulcate somewhat asymmetrical apex. The material is somewhat scanty and for the most part in bad condition. No specimens show the form and arrangement of the antheridia, yet the species appears to be most nearly allied to *L. equatorialis*, which also occurs on *Casnonia* in Brazil.

Laboulbenia equatorialis Thaxter. Plate LXV, figs. 10–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 174. Dec., 1899.

Perithecium free, hyaline becoming tinged with brown, slender and elongate; the basal wall-cells forming a well marked though not clearly differentiated hyaline stalk; a median and subterminal external prominence; the rather broad tip more or less deeply tinged with blackish brown, rather abruptly differentiated and bent outward, the lip-edges hyaline, the inner lip-cells prominent, more deeply suffused. Receptacle very long and slender, cell I short, cell II greatly elongated, cells III and VI about equal. Insertion-cell broad, deeply blackened. Outer appendage consisting of a somewhat rounded basal cell, which is hyaline externally, distally suffused with blackish brown, and bearing two branches antero-posteriorly; the outer of which consists of a nearly isodiametric basal cell, becoming opaque except its upper inner angle, from which arise two branches; the inner simple, becoming red-brown, distinguished by a broad black septum, the outer consisting of a small basal cell, opaque, except its inner upper hyaline angle, and bearing two branches; an inner dark red-brown and slender, an outer curved outward and upward, more slender, deep red-brown, opaque toward the base, the inner branch from the basal cell of the outer appendage consists of a basal cell like that of the outer branch, which bears distally two branches, red-brown, about equal, the lower two cells inflated inward. The inner appendage consists of a slightly smaller basal cell bearing a branch on either side, the basal cell of each branch shorter, and giving rise typically to paired branchlets from the basal cells of which the large, long, slender deep red-brown antheridia are produced in pairs. Perithecia 400–760 μ. Total length to tip of perithecium, average 550 μ; longest over 1 mm.; average breadth 50 μ. Appendages, longest 375 μ.

On upper surface of prothorax, at base of clytra and on legs of *Casnonia* sp., Brit. Mus. No. 502, Amazon River.

A very distinct species, readily recognized by its long large slender dark paired antheridia, its slender coarse tipped perithecium, etc. It does not appear to be very closely allied to any described species, unless perhaps to *L. falcata*, which occurs on a similar host in Brazil.

Laboulbenia dentifera Thaxter. Plate LXI, fig. 8.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 34. June, 1902.

Perithecium relatively large, as long or longer than the receptacle, straight, erect, almost wholly free, rather dark dull brown; the outer margin distally converging rather abruptly in an almost straight line to the apex; one (the right) of the lateral lip-cells prolonged obliquely inward and upward to form a large tooth-like projection. The receptacle relatively short and stout, the basal cell longer, hyaline and contrasting, except distally, where it is involved in the general uniform dark dirty olive-brown suffusion of the rest of the receptacle, the cells of which are short and broad, punctate, hardly distinguishable. The insertion-cell thick, black, rather narrow, the basal cell of the outer appendage short and stout, bearing distally an inner and an outer branch, the basal cell of the outer bearing two branches, the black contrasting constricted base, only, of the outer, persisting; the appendages otherwise hyaline, stout, tapering slightly; the basal cell of the inner appendage very small, roundish, bearing a branch on either side with single antheridia near the base. Perithecium 125 × 32 μ, the tooth-like appendage 20 μ. Receptacle 115 × 55 μ. Appendage 220 μ. Total length to tip of perithecium 240 μ.

A single specimen on the margin of the clytra of *Notiobia disposita* Bates; British Museum No. 678; Chontales, Nicaragua.

A more careful examination of the type of this species suggests that the very peculiar conformation of the tip of the perithecium may be to some extent abnormal. It is to be hoped that more material may be obtained from which its characters may be more exactly determined. It is hardly possible to say to what species it is most nearly allied.

Laboulbenia Chiriquensis Thaxter. Plate LVI, fig. 18.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 164. Dec., 1899.

Perithecium yellowish brown, straight, the inner margin convex, the outer slightly concave, tapering distally to the broad short blackened tip, which is bent abruptly inward almost at right angles. Receptacle yellowish brown, deeper in the region of cell III, the basal cell slightly curved, its upper half rather abruptly expanded; a more or less distinct bulge below the perithecium. Outer appendage usually simple, stout, the basal cell of the inner usually much smaller bearing a branch on either side usually once branched above the basal cell; all the branches stout and constricted at the lower septa. Spores 60 × 4 μ. Perithecium 100–125 × 37 μ. Total length to tip of perithecium 200–270 μ; to insertion-cell 135–160 μ. Greatest width 55 μ.

On margin of clytron of *Callida scintillans* Bates, Brit. Mus. (Biologia Coll.), No. 735, Volcan de Chiriqui, Panama.

This species is chiefly distinguished by the peculiar conformation of the tip of its free perithecium which is somewhat similar to that seen in *L. Loxandri*. The two species, however, are otherwise readily distinguishable.

Laboulbenia Eudaliæ Thaxter. Plate LVIII, figs. 7–8.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 36. June, 1902.

Perithecium transparent brown, nearly straight externally, the inner margin somewhat convex; the inner lip-cells deeply suffused, contrasting, coarse, erect, prominent, the lip edges hyaline, outwardly oblique. Receptacle normal, rather short and stout, somewhat prominently rounded below the perithecium; cell III smaller than cell VI; cells IV and V broad, equal in length, prominent below the broad insertion-cell. Outer appendage consisting of from three to four mostly roundish or flattened superposed cells, constricted at the blackened septa, which become oblique by the proliferation of each cell from its inner side to form a single, usually simple, erect branch; the branches eventually stout, rather closely septate, thick-walled; the basal cell of the inner appendage half as large as that of the outer, producing one or more simple branches similar to those of the outer appendage, and short antheridial branchlets, which bear the brown, slightly curved antheridia in a rather dense group. Spores 72 × 5 μ. Perithecia 150–155 × 55 μ. Receptacle 170–220 μ. Appendages 180–225 μ. Total length to tip of perithecium 250–350 μ.

On elytra and legs of *Eudalia latipennis* MacLeay, Port Denison, Australia. Berlin Museum, No. 952.

The outer appendage is broken in all the types of this species which are not very young, but in the latter the character of the appendage is clearly shown (fig. 8); the primary axis consisting of short inflated cells, each of which is distinguished by a blackened septum and bears a branch from its inner side. The relationships of this species are quite uncertain, but perhaps it may be placed as well near *L. Loxandri* as elsewhere, although the outer appendage of the latter species is simple.

Laboulbenia Loxandri Thaxter. Plate LVI, fig. 5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 183. Dec., 1899.

Perithecium about three fourths free, suffused with brownish, translucent, the distal half narrow and strongly curved inward, especially at the tip, the latter externally and distally blackened, the lip-edges hyaline. Receptacle rather stout, pale dirty brownish; cell II basally and distally and cell VI externally more deeply suffused. Cells IV and V elongated so that they become parallel and carry the insertion-cell upward and outward free from the perithecium. Outer appendage consisting of a rounded basal cell bearing a single terminal branch, the basal cell and one or two cells above it rounded, constricted at the mostly blackened septa, simple or each of the lower cells producing distally on the inner side a branchlet, the branchlets and the terminal portion of the main branch hyaline, slender, thin-walled, tapering. Inner appendage consisting of a basal cell like the outer and like it producing a branch on either side. Spores about 45 × 4 μ. Perithecium 140 × 40 μ. Total length to tip of perithecium 340 μ; to insertion-cell 275 μ. Appendages, longest 120 μ.

On elytra of *Loxandrus unistigma* Bates, Brit. Mus. No. 659 (Biologia Coll.), Paso Antonio, Guatemala.

A well marked species, perhaps allied to *L. Chiriquensis*, but differing in its appendages and in other important respects. It has been seen only in one instance among the numerous forms of *Loxandrus* examined.

Laboulbenia Egæ Thaxter. Plate LVI, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 173. Dec., 1899.

Perithecium free or nearly so, slender, usually somewhat curved inward, becoming evenly suffused with pale-olive brown, the broad tip not differentiated from the body of the perithecium, the lip-cells more or less suffused with darker brown. Receptacle pale yellowish, often elongate, the basal cell short; cell II several times as long, becoming amber-brown with transverse striations; cells III and VI about equal, elongate. Insertion-cell not deeply blackened. Outer appendage consisting of a usually somewhat inflated basal cell with thick outer wall, bearing a branch terminally distinguished by a thin black septum and often a second subterminally on the inner side, the branches simple or once branched, subhyaline; the inner appendage consisting of a basal cell half as large as that of the outer, bearing one to three simple or once divided branches on either side: the branches of both appendages subhyaline, mostly thin-walled, erect in a compact small tuft, tapering slightly, extending but slightly above the tip of the perithecium Perithecium 190–225 × 34 μ. Total length to tip of perithecium 540–680 × 65 μ; to insertion-cell 375–470 μ. Appendages 175–200 μ.

On elytra of *Ega* sp., Paris Mus. No. 151, Acapulco, Mexico. On *Ega Sallei* Chev., Brit. Mus. No. 705, Biologia Coll., Paso Antonio and Champerico, Guatemala.

A slender pale species which varies in the development of its appendages, the basal cells of which are variably proliferous; the outer, which is characteristically inflated, bearing from one to three branches, one of which may obscure those of the inner basal cell, as in fig. 12, from which one to two branches may arise on either side. It does not appear to be nearly related to any of the described species, but is perhaps as nearly allied to *L. Philonthi* as to any other.

Laboulbenia Columbiana Thaxter. Plate LVI, figs. 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 30. June, 1902.

Uniform amber-yellow. Perithecium straight, free, converging abruptly from the base toward the appendages at an angle of about 45°, slightly and nearly symmetrically inflated, the tip relatively broad, with darker subterminal suffusions; the lip-cells somewhat spreading, the posterior and two lateral ones forming distinct ear-like lateral horizontal prolongations. Receptacle normal, tapering to the pointed foot, the basal and subbasal cells relatively large, the latter largest, cells IV and VI subequal; cell V separated obliquely from cell III, and somewhat longer than cell IV, which is separated by a horizontal septum. Insertion-cell thick, somewhat translucent, purplish. Outer appendage simple, short; the basal cell faintly purplish, more or less abruptly convex externally, separated by a constriction and dark septum from the subbasal cell, which is also distinguished above by a dark septum, basal cell of the inner appendage smaller than that of the outer, bearing a simple short erect branch on either side. Spores 50 × 4 μ. Perithecia 20–25 × 90–110 μ. Receptacle 150 × 30 μ. Appendages 40 μ. Total length to tip of perithecium 200–250 μ.

On bristle-like hairs on the elytra of *Anchonoderus concinnus* Reiche, Columbia; Berlin Museum, No. 1023.

A single specimen, fig. 7, 680 μ long, with a free perithecium curved outward, with only lateral finger-like projections and with appendages 300 μ in length which are otherwise similar to those of the type, was found on the same host; but in the absence of further material it is not possible to determine whether or not it should be considered a mere variety. It is not impossible that the type form on spines owes its short habit and small size to less abundant nutrition, but the two may prove distinct.

Laboulbenia Philonthi Thaxter.

This species appears to be strictly American, and nothing resembling it, except perhaps *L. Bledii*, occurs on other staphylinids. Additional material has been obtained as follows: British Museum; No. 747 on *Philonthus ochromerus* Sharp, Vera Cruz; No. 748 on *P. occultus* Sharp, Guatemala; No. 749 on *P. incertus* Solsk., City of Mexico. Sharp Coll.; No. 1108 on *P. acciderus* Sharp, Guatemala; No. 114 on *P. furvus* Nordm., var. *Flohrii* Sharp, Mexico; No. 1115 on *P. furvus* Nordm., California. It has also been obtained on numerous undetermined *Philonthi* from New England and Florida and is the common species on these hosts in temperate South America.

Laboulbenia Bledii Thaxter. Plate LVI, figs. 8–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 27. June, 1902.

Color uniformly pale dirty yellowish. Perithecium more than two thirds free, rather slender, tapering to the tip, which is more or less well distinguished; the lip-cells rather coarse and prominent, with a subterminal blackish shade on the inner side. Appendages divergent and free through the enlargement of cell V: the outer appendage simple, short, four- to five-celled; the basal cell of the inner appendage somewhat smaller than that of the outer, bearing a branch on either side similar to the outer appendage, the three straight closely applied in a more or less compact group. Receptacle rather coarsely punctate, the basal cell slender below and suffused above the foot, rather short, and separated from the usually very long subbasal cell by a more or less distinct constriction; cells III, IV and VI subequal, more than half the upper margin of cell V free. Perithecia 100–125 × 35–40 μ. Receptacle 220–275 × 45 μ. Appendages about 90 μ. Total length to tip of perithecium 290–360 μ.

On elytra and abdomen of *Bledius jacobinus* Lec., California; Sharp Collection, No. 1174, on *Bledius basalis* Lec., Florida (Henshaw Collection).

Figure 8 and 10 of the accompanying plate represent the Californian specimens of this species, and fig. 9 one of the smaller stouter forms occurring on *Bledius* in Florida. None of the material is in very good condition and I have even been led to suspect that the species might prove a depauperate condition of *L. Philonthi* which, however, in its typical condition would appear to be abundantly distinct.

Laboulbenia Formicarum Thaxter. Plate LVIII, figs. 14–15.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 39. June, 1902.

Basal cells of the perithecium small, compact, not distinguished from the body, which is suffused by darker brown shades and tapers from near the broad base, with but slight inflation, to the well-distinguished tip; which is more or less distinctly curved outward, with subterminal blackish suffusions on both sides; the rather blunt, coarse-lipped apex outwardly oblique. Receptacle abnormal in form, very short and stout, the basal cell small hyaline, narrow below, abruptly broader distally below the subbasal cell, which is broader than it is long and bulges prominently externally, giving the plant a humpbacked habit; cell III small, broader than it is long; cell IV small, squarish separated from cell V which is slightly smaller, by a nearly vertical septum. Appendages normal, insertion-cell blackened, but not deeply, the outer appendage simple, the three lower cells inflated, the subbasal cylindrical and distinguished by dark septa. Spores 30 × 2.5 μ. Perithecia 50–60 × 16–18 μ. Receptacle 30–35 × 18 μ. Longest appendages 90 μ. Total length to tip of perithecium 70–80 μ.

On all parts of *Lasius Americanus* M. and of *Formica neogagates* M., Cambridge, Mass.

This very minute and peculiar species appears to be common on small ants in the Cambridge region. It is perhaps as nearly related to *L. inflata* as to any other species, the appendages being very similar in both cases. The conformation of the receptacle is, however, unlike any other species. *Rickia Wassmanni* is thus far the only other member of the family that is known to occur on true ants.

Laboulbenia microscopica Thaxter. Plate LVI, fig. 17.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 187. Dec., 1899.

Perithecium one half or wholly free, pale olivaceous, somewhat inflated, tapering to the relatively long narrow subtruncate blackened tip which is bent slightly inward. Lower half of receptacle greatly reduced in size, the basal cell hyaline or nearly so, the rest suffused with dark brown, cell III paler, cell II broader than long, cells III to V relatively large, bulging prominently outward beyond and below the insertion-cell. Outer appendage consisting of a basal cell which becomes sub-triangular through the protrusion of its upper outer angle which renders its distal margin twice as broad as the basal cell of the single branch which rises from its upper inner half. The inner appendage arising from a much smaller basal cell which produces two branches. Spores about 35 × 3 μ. Perithecia 75–93 × 27–34 μ. Total length to tip of perithecium 120–140 μ; to insertion-cell 75–90 μ. Greatest width 45–60 μ. Appendages about 70 μ.

On elytra of *Pelmatellus nitescens* Bates, Brit. Mus. (Biologia Coll.), No. 683, Vera Paz, Guatemala.

One of the very smallest species, in which the perithecium is larger than the whole of the receptacle. Apart from other peculiar characters, the shelf-like projection of the basal cell of the outer appendage serves to distinguish this form, a somewhat similar conformation occurring only in *L. Tachyis.* Three specimens, only, have been examined.

Laboulbenia Tachyis Thaxter. Plate LVI, fig. 15.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 38. June, 1902.

Form slender. Perithecium tinged with brown, relatively small, narrow, erect, very slightly curved outward distally, about three quarters free, tapering slightly to the relatively broad, hardly differentiated tip; the lip-cells coarse, outwardly oblique, with hyaline edges. Receptacle slender, the basal and subbasal cells hyaline, elongate, nearly equal in length; the distal portion tinged with brown. Basal cell of the outer appendage forming a well defined prominence distally and externally; its upper surface horizontal, the outer half free, the inner half bearing a solitary branch which may be rather elongate, slender tapering; its basal cell short, somewhat inflated, distinguished by dark septa; the basal cell of the inner appendage giving rise to an erect branch on either side similar to the outer. Perithecia 60–75 × 16–25. Receptacle 110–166. Appendages longest 220 μ. Total length to tip of perithecium 155–220 μ.

On *Tachys incurvus* Say, Cambridge. On *Tachys* sp., Cocoanut Grove, Florida, December. On *Tachys* sp., Kittery Point, Me.

This small and slender species is peculiar for the conformation of the basal cell of its outer appendage, the external projection of which varies somewhat in different specimens. It resembles *L. microscopica* in this respect, but is otherwise quite different. It appears to be a rare species, occurring singly, or in pairs, on a given individual of its minute host. Specimens on the legs may be much shorter and more compact in habit.

Laboulbenia olivacea Thaxter. Plate LV, fig. 3.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 315. July, 1905.

Perithecium nearly free, broader distally, olivaceous brown, paler and subhyaline distally on the inner side; the inner margin bulging characteristically above and curved abruptly outward to the tip, which forms a flat blunt hyaline papilla, turned outward and hardly distinguished from the body of the perithecium, and wholly subtended by a wide blackish suffusion, the outer margin forming a slight curvature continuous with that of the receptacle. Receptacle relatively small, the basal cell small, narrow, and quite hyaline, except distally, where it is partly involved in the dark olive-brown suffusion of the rest of the receptacle, which is coarsely punctate in the region of cells II and III, sometimes becoming wholly opaque and indistinguishable from the base of the perithecium, with the exception of cell V and a corresponding cell of about equal size which lies external to it, being cut off distally from cell IV, the receptacle being abnormal in this respect. These two cells hyaline or translucent, the whole anterior margin, from the base of cell II to the tip of the perithecium, forming a nearly symmetrical continuous curvature. Outer appendage consisting of a small slightly prominent basal cell, slightly constricted above, where it is separated by a blackish septum from a hyaline erect slender nearly straight distal portion or branch: the basal cell of the inner appendage somewhat smaller, giving rise to several erect branches, like the outer, which reach about to the tip of the perithecium, or may be longer. Perithecia 80–100 × 32–40 μ. Receptacle 90 μ. Appendages 75–110 μ. Total length to tip of perithecium 185–220 × 40–48 μ.

On legs and on the inferior surface of the abdomen of *Lebia* sp., Java; Rouyer, No. 1396.

Closely resembling *L. curtipes* in general form, but unlike all other species in the regular secondary division of cell IV by a horizontal septum, a condition which appears to be the normal one, as it is present in all of the ten examples examined. This condition is approached in *L. Anaplogenii* in which, however, the division is not invariably present, and results from a distal proliferation.

LABOULBENIA PRODUCTA Thaxter. Plate LXIV, figs. 13–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 52. June, 1902.

Perithecium faintly tinged with pale dirty brown, rather long and slender, nearly erect, free except the rather narrow subhyaline base; the lips somewhat prominent, outwardly oblique, the inner subtended by a dark suffusion. Receptacle tapering to a slender pointed base, the basal cell hyaline, becoming faintly tinged with dirty brownish, contrasting with the opaque subbasal cell which is less than twice as long; cells III and VI subequal, nearly opaque, reddish brown; cell IV nearly opaque, continued upward to form a free blunt well-defined prominence which projects beside and slightly beyond the basal cell of the appendage; cell V relatively very large, extending to the base of cell IV, wholly pale dirty brown like the perithecium, contrasting. Insertion-cell relatively large, slightly oblique inward, resting below on cell V and laterally and obliquely on cell IV. Basal cells of the appendages nearly equal, subisodiametric, the outer bearing an outer and an inner simple hyaline branch distally, the basal cells of which, especially the inner one, are more or less inflated, roundish, with dark septa, and tinged with dirty brown; the basal cell of the inner appendage bearing a branch on either side similar to those of the outer, the branches hardly extending to the tip of the perithecium. Spores 55 × 4 μ. Perithecium 90–100 × 25 μ. Receptacle 110 μ to insertion-cell, the projection above 10–12 μ. Total length to tip of perithecium 220 μ.

Growing appressed on the bristle-like hairs on the elytra of *Anchonoderus concinnus* Reiche, Columbia; Berlin Museum, No. 1023.

This species is widely different from any other known species and is at once distinguished by the finger like protrusion of cell IV. The only other species that shows a similar tendency is *L. Anaplogenii* to which, however, it is not at all related. The type of the appendages, the short inflated basal cells of the branches, and their dark septa and mode of origin, suggest a remote connection with forms like *L. celestialis*, but it seems on the whole distinctly isolated. Fig. 13 represents a well developed individual obtained on an undetermined host, without locality, in the collection of the Museo Nacional at Buenos Aires.

LABOULBENIA CELESTIALIS Thaxter. Plate LXV, figs. 13–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 163. Dec., 1899.

Perithecia almost wholly free, rather deeply suffused with dark reddish brown except the almost hyaline basal wall-cells; tapering slightly to the well distinguished rather large tip, which is turned slightly outward, the lip-cells blackened except around the pore. Receptacle finely punctate, pale dirty brown, darker along the posterior margin, the lower half of cell I hyaline, rather short and stout, somewhat abruptly expanded below the perithecium; cell IV bulging abruptly below the black insertion-cell. Outer appendage consisting of a somewhat rounded basal cell, brown externally, and bearing usually two branches placed antero-posteriorly, the basal cell of the outer nearly round, deep brown externally and bearing two branches placed antero-posteriorly which are very long and slender, remotely septate and more or less suffused with dirty brown: the inner appendage consisting of a smaller basal cell producing a branch on either side, the basal cells of which are short with black septa and bear solitary antheridia or short sterile branches which are blunt and shorter than the perithecium. Perithecia 110 × 35 μ. Total length to tip of perithecium 280 μ; to insertion-cell 156 μ. Greatest width 55–60 μ. Appendages (longest) 400 μ.

On the elytra of *Drypta lineola* Dej., Brit. Mus. No. 507, China. On *Dichranoncus celestinus*, Sharp Collection, No. 1204; and British Museum No. 636, Japan; on *Drypta ruficollis* Dej., British Museum No. 506, Natal, Africa.

The specimens on *Dichranoncus* referred to this species, differ somewhat in their more slender form, darker color, and deeply suffused perithecia; the receptacle is usually enlarged between cells I and II, and the inner branches from the basal cell of the outer appendage are often paired. In the Natal specimen this inner branch is not distinguished by the usual black septum. It is possible that we are here dealing with more than one species, but in the absence of abundant material they have been included with the type. The latter is most nearly related to *L. Asiatica*, but should, I think, be kept distinct.

LABOULBENIA ASIATICA Thaxter. Plate LXV, fig. 15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 159. Dec., 1899.

Perithecium and receptacle typical in form more or less suffused with dirty brownish yellow, the perithecium somewhat smoky-brown above the basal wall-cells. Outer appendage consisting of a very large subtriangular hyaline basal cell, which gives rise from a deeply blackened area of insertion to an antero-posterior series of short stout cells, themselves outwardly blackened and bearing from one to three branchlets, also placed antero-posteriorly and themselves mostly once branched in a similar plane; the ultimate branchlets rather long and remotely septate, the lower septa blackened and somewhat oblique. The inner appendage consists of a much smaller basal cell which gives rise on either side to a series of from two to three branches arranged antero-posteriorly, the lower septa blackened and more or less oblique, the branches once or twice branched, the branchlets shorter than those of the outer appendage. Perithecium 140 × 45 *µ*. Total length to tip of perithecium 400–500 *µ*. Appendages (longest) 400 *µ*.

On the elytra of *Casnonia* sp., Asia, Paris, No. 139.

This species is exactly similar in the general form and appearance of its receptacle and perithecium, to the common types of *L. flagellata*, but differs in the erect-like series of branches, distinguished by black septa, that form dense tufts arising from the inner and outer basal cells of the appendages. The species is most nearly related to *L. celestialis*, of which it may prove to be a luxuriantly developed condition.

LABOULBENIA ACROGENYS Thaxter. Plate LXVI, figs. 6–8.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 154. Dec., 1899.

Perithecium rather slender, free except at its base, pale yellowish or straw-colored, becoming yellowish brown, tapering to the neck-like rather slender often almost clavate apex, the lip-cells hyaline, well distinguished, the inner large and prominent often spreading, the pore obliquely external: below more or less deeply suffused with smoky brown, especially the outer half, the posterior (outer) subterminal wall-cells often becoming deeply suffused with smoky brown. Receptacle usually short, becoming slightly suffused with yellowish brown, normal in form, sometimes slightly inflated between cells I and II. Outer appendage consisting of a large rounded basal cell bearing four to eight branches arranged antero-posteriorly in a more or less definitely double row, their insertions forming a continuous deeply blackened area, their cells inflated, with blackened septa, successively once to three times branched antero-posteriorly. The inner appendage consisting of a much smaller basal cell producing from one to two branches similar to those of the outer, one on either side. The antheridia solitary or from two to four, borne rather regularly on the ends of short branchlets. Perithecium 90–175 × 28–35 *µ*. Antheridia 14 *µ* long. Total length to tip of the perithecium 190–360 *µ*. Appendages 85–100 *µ*. Spores about 40 *µ*.

Occurring on the inferior posterior margin of the prothorax and the adjacent portions of the thorax of *Acrogenys hirsuta* MacLeary, Brit. Mus., Nos. 668 and 528, Australia, and Union Reefs, Australia.

This species is nearly allied to *L. Asiatica*, the appendages being similarly arranged, though very different in general appearance: the clear hyaline cells of the copiously divided branches inflated, and strongly constricted at the blackened septa, five or six of which may occur successively from the base upward. The conformation of the perithecium is distinctly different, especially at the tip, which is usually even more prominently distinguished than is represented in the figures, the inner lip-cell considerably enlarged to form a rounded or flat topped somewhat spreading termination. Two immature specimens were obtained on *Acrogenys* from Union Reefs, in which the branches are more copiously developed and the insertion-cell wholly unmodified. The antheridia, which are small and well formed, often occur in terminal groups of three to five, closely appressed, almost as in some forms of *L. Brachini*. (Monograph, Plate XX, fig. 7.)

LABOULBENIA MINIMA Thaxter.

The figures drawn from the material available at the time my Monograph was published, give but an inadequate idea of the appearance of full grown specimens of this well marked and rather variable species, additional material of which has been obtained from the following sources; British Museum; No. 732 on *Callida pulchripennis,* no locality; No. 736 on *C. onyptcrigioides,* Volcan de Chiriqui, Panama; No. 551 on *Callida* sp., Mexico; No. 503 on *Pionycha* sp., Nanta, Amazon; No. 504 on *Leptotrachelus* sp. Sao Paulo (? Brazil); No. 510 on *Calophæna maculata* Dej., Para, Brazil: Hope Collection; No. 264 on *Agra* sp., South America: Paris Collection; No. 68–69 on *Callida* spp., Venezuela. All these forms, though undoubtedly referable to this species, show a certain amount of variation, in coloration, in the degree and conspicuousness of the punctation, which is sometimes very marked even on the perithecium; in the conformation of the tip of the perithecium, which is sometimes flat topped and peculiarly modified, and in the development of the appendages. The latter arise in crest-like series from the basal cells: one such series from the outer, which may consist of seven or eight members which arise by successive proliferation from the inner angle of the basal cell and are variably branched and suffused; the inner basal cells producing a somewhat similar series on either side. The general type is similar to that seen in *L. longicollis* which, although so very different in general appearance must be considered as not remotely related to it. On species of *Agra* in the Hope Collection, and in the British Museum, specimens occur in which the differences are so considerable that I think these forms may perhaps be specifically separated; but I have preferred to defer any further account of them until I have an opportunity properly to illustrate the present species, figures of which could not conveniently be included in the accompanying plates.

LABOULBENIA BRACHINI Thaxter.

This species replaces *L. Rougetii* on American *Brachini,* but although very similar in form and color, differs distinctly in the centripetal proliferation of the basal cells of the appendages, in the black oblique septa of their branches, and in the grouping of the antheridia. Simple forms of this species in which there is no proliferation of the basal cells, are hardly distinguishable from some South African specimens of *L. Rougetii,* and in one instance typical *L. Brachini* was obtained on a specimen in the British Museum labeled "*B. oblongus* Dej. Tangier, Africa." That there is some error, either in my own, or in the Museum label, I feel quite sure; since this is the only instance among the very large number of Eastern-Hemisphere *Brachini* which I have examined, in which a form like *L. Brachini* has been observed. *L. Rougetii* var. *Japanensis,* with its dense stout appendages bears a superficial resemblance to this species, but there is no doubt in my own mind as to the distinctness of the two.

Additional material has been examined as follows. Paris Museum No. 67 on *Brachinus* sp., Venezuela; Hope Collection No. 249 on *Brachinus* sp., Rio de Janeiro; No. 245 on *B. fumans* Fabr., North America; No. 247 on *B. geniculatus* Dej., St. Thomas W. I., a curious hunched variety (?) with very simple appendages: British Museum No. 720 on *B. rhytiderus* Chd., Oaxaca, Mexico; No. 719 on *B. elongatus* Tourn. Mexico; No. 544 on *B. geniculatus* Dej., South America: Berlin Museum No. 990 on *B. Mexicanus* Dej., Mexico; No. 991 on *B. fusicornis* Dej., Buenos Aires, Argentina; No. 992 on *B. genicularis* Dej., Montivideo, Paraguay; No. 993 on *B. nigrescens* Chd., Brazil.

LABOULBENIA LONGICOLLIS Thaxter. Plate LXIV, fig. 10.

Abundant material of this fine species has been obtained from various sources, and it seems to be the only form which occurs on the numerous African species of *Galerita;* in marked contrast to the multiplication of species which has taken place on this host in the western hemisphere. Although in its general appearance, large size and stalked perithecia, it recalls the condition seen in many of the American forms on *Galerita* it does not appear to be at all closely related to the species of this well marked "*Galeritae*" type, the series of appendages arising, not from cells successively separated above the basal cell, but from the basal cell itself, which does not become divided during the process. The species shows no important variations except in size. The additional material examined is as follows: Berlin Museum No. 972 on *Galerita femoralis* Murr., Gaboon; No. 971, on *G. attelaboides* Fabr., Guinea. Paris Museum No. 10 on *Galerita* sp., East Africa. British Museum No. 522 on *G. femoralis* Murr., E. Africa; No. 524 on *G. Africana* Dej., Angola; No. 523 on *G. interstitialis* Dej., Sierra Leone. Fig. 10 of the accompanying Plate is drawn from material on an undetermined species of *Galerita* collected by Dr. O. F. Cooke in Liberia.

LABOULBENIA ORIENTALIS Thaxter. Plate LXV, fig. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 191. Dec., 1899.

Perithecium straight, its base free from and higher than the insertion of the appendages, straight to strongly recurved, becoming suffused with pale brownish; the tip blackish brown in normal specimens, well distinguished, with prominent lips (when curved, not abruptly distinguished, somewhat pointed, with ill defined lips), the translucent edges dirty brown. Receptacle hyaline or concolorous with the perithecium, sometimes becoming dark smoky brown; cell V often as large as cell IV, pushing the small subtriangular unmodified insertion-cell outward so that it may become lateral, with its transverse diameter vertical, cell VII unusually large. Appendages consisting of an outer and an inner basal cell, the two free from one another except at the base, mostly several times as long as broad and overlapping slightly; the outer bearing an external row of superposed branches, usually seven or eight in number, formed by the successive proliferation of the tip of the basal cell, and separated from it by broadly blackened septa; the branches successively subdichotomously branched several to eight or more times, the basal and sometimes the subbasal cell often producing more than two branchlets (two to four) superposed in a single row. The inner appendage like the outer, the basal cell producing a single similar row of branches fewer (usually two to four) in number, overlapping those of the outer appendage and bearing antheridia in groups of from one to eight not characteristically grouped, the venter rather abruptly distinguished from the straight cylindrical purplish neck: the branches of both appendages directed outward, hyaline or distally reddish or purplish, constricted at the lower purplish septa. Perithecia (largest) 230 × 55 μ; average 170 × 40 μ. Total length to tip of perithecium very variable, from 275 μ to 1 mm. Appendages 200–350 μ. Antheridia 16 × 4 μ. Spores 65 × 6.5 μ.

On *Brachinus Chinensis* Chaud., Paris Museum, Nos. 58, 59; Manila, Philippine Islands, and Macao, China. Brit. Mus. Nos. 536 (bis), China. Hope Coll. No. 244, China. On *Brachinus* spp., Brit. Mus. Nos. 537, 539, 540, China and Philippine Islands, Berlin Mus., No. 994 on *B. scotomedes* Redt., Japan. Usually on inferior surface of thorax and prothorax.

This fine species is a characteristic form, common on the larger species of *Brachinus* from the far East. Although it has not been seen on the numerous *Brachini* examined from intermediate stations, the form previously separated as *L. Italica* on *B. explodens* from Italy, does not appear to be more than a variety. The species is decidedly variable in form, size and color, often abnormally bent, as in Fig. 5, or greatly elongated; becoming suffused in many cases till the perithecium is nearly opaque. The vertically elongated basal cell of its inner appendage lacks entirely the right and left development of branches which normally occurs in the genus, and usually overlaps the similarly developed basal cell of the outer appendage. A similar condition is seen in *L. pusilla*, *L. Japonica* and *L. rhinophora*, yet these three forms seem otherwise so different that their separation as distinct species appears desirable.

var. ITALICA Thaxter. Plate LXVI, figs. 9–10.

L. Italica Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 182. Dec., 1899.

Perithecium free except at its base, rather short and stout, the upper half or third curved strongly outward, the tip large, sulcate, blackened, the lips coarse, nearly equal, subhyaline. Receptacle concolorous with the perithecium, the base nearly hyaline, usually bent between cells I and II, short, abruptly expanded above cell II, the anterior margin straight above cell I. Appendages compact, the basal cells subtriangular, the outer producing externally an oblique row of about four superposed branches from a blackened area of insertion, the branches erect mostly twice subdichotomously branched, all the lower septa blackened and constricted, the inner appendage similar to the outer: the insertion-cell unmodified normally placed, broad, subhyaline, close to base of perithecium. Antheridia brown, the venter much inflated, the neck becoming pointed, 23 × 8 μ. Perithecium 100 × 42 μ. Total length to tip of perithecium 275 μ; to insertion-cell 175 μ. Appendages 140 μ.

On *Brachinus explodens* Duft., Florence Museum, Florence, Italy.

Laboulbenia pusilla Thaxter. Plate LXV, fig. 6.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 316. July, 1905.

Short, stout, pale yellowish with brownish tinges. Perithecium free, straight, very slightly narrower distally, the distal portion, except externally about the hyaline pore, deep black, the suffusion extending less than half-way down externally, and about a third on the inner side: the distal end broad, flat, projecting on the inner side to form a rounded prominence; the pore lateral and external, hyaline, with adjacent paler shades; the black, slightly projecting area below it forming a more or less clean-cut line of demarcation. The receptacle short and stout; cells I and II subequal, as are also cells III and IV. Appendages as in *L. orientalis*, hyaline, the two basal cells partly overlapping and bearing each four to five branches four to five times branched, the cells distinguished by constrictions and blackish septa. Spores 45 × 5 μ. Perithecia 90 × 36–40 μ. Receptacle 100–110 μ. Total length to tip of perithecium 200 × 210 μ. Appendages 100–110 μ.

On inferior surface of *Brachinus scotomedes* Redt., Japan; Berlin Museum, No. 994.

This very peculiar little form is most nearly related to *L. orientalis* of which it may possibly prove to be an abnormal condition. It is however quite unlike the smaller forms of this species which grow in similar situations, and the types show no tendency to vary toward the normal form, even very young perithecia exhibiting the very peculiar conformation represented in fig. 6.

Laboulbenia Japonica Thaxter. Plate LXV, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 44. June, 1902.

Short and stout, unevenly suffused with smoky or faintly olive brown. Perithecium relatively very large and long, more or less distinctly curved toward the appendages; the base subhyaline, the body evenly dark, slightly olivaceous brown, scarcely inflated, tapering very slightly to the stout, evenly rounded, opaque, hardly differentiated tip; the longitudinal series of wall-cells slightly spiral, describing about one quarter of a turn or somewhat more. Receptacle relatively small, short and stout, the basal and subbasal cells hyaline, contrasting, the latter somewhat larger, separated by an oblique partition from cell III, which is small, subtriangular and deeply suffused; cell IV larger, suffused, as is cell V, which is relatively large and long-oval; cell VI deeply suffused, extending down beside and to the base of cell II; the cells above it also suffused and more or less indistinguishable. Insertion-cell large and unmodified. Basal cells of the outer and inner appendages vertically elongated, each bearing externally and distally a series of four or five superposed branches distinguished by blackened septa, curved outward and often downward, and branching in a radial plain, the branches two to four times branched, forming a compact tuft, the basal cells usually bearing three branchlets, the further division of which is subdichotomous; the cells not differing very greatly in size, except the terminal ones, which are somewhat elongated hyaline subisodiametric and blunt-tipped. Spores 80 × 5 μ. Perithecia 235 × 70 μ. Receptacle 185 × 70 μ. Appendages 100–150 μ. Total length to tip of perithecium, average, 420 μ.

On anterior legs of *Brachinus* sp., Japan; Sharp Collection, No. 1188.

This is a striking species allied to *L. orientalis* and more closely to *L. rhinophora*, which has the same peculiarly developed receptacle in which cell VI extends downward to cell I, although it lacks the monstrous development of cells IV and V peculiar to this species. The perithecium is also quite different and unlike any forms of *L. orientalis*, both in form and relative size. The appendages project out subhorizontally in a compact mass, with a tendency to recurve, and the branching is in a plane coincident with that in which the individual is flattened. A somewhat smaller variety, which closely resembles this species, was found on the legs of a species of *Brachinus* from Port Natal, Africa (Berlin Museum No. 983), but the material is too scanty and not in sufficiently good condition to determine definitely.

LABOULBENIA RHINOPHORA Thaxter. Plate LXV, figs. 8–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 199. Dec., 1899.

Perithecium large and stout, dirty smoky brown, the lower half much deeper and united to the receptacle, the base nearly opaque, one of the subterminal wall-cells forming a terminal blunt finger-like brown outgrowth, close beside the rather small internally blackened tip, which it exceeds in length. Receptacle stout, the basal cell small hyaline; a blackish brown suffusion becoming opaque involves the upper part of cell II, cells III, VI, and VII, as well as the basal cells of the perithecium; cells IV and V very large and nearly parallel, translucent; the suffused parts, when not opaque, marked by darker transverse dots and striæ. Insertion-cell very large, triangular, quite unmodified. Appendages consisting of two basal cells concolorous with insertion-cell, the outer usually somewhat larger, both protruding upward and slightly overlapping, producing directly numerous branches (four to eight from each cell) which arise in more than one row from their outer surfaces; all the branches once to twice branched, the lower segments deeply constricted at the purplish septa, the distal cells without constrictions at the hyaline septa. Spores 75 × 5 μ. Perithecia to tip of protuberance 275–300 × 85 μ; to insertion-cell 300–340 μ. Appendages about 200 μ.

On the legs of *Brachinus* sp., Hope Coll. No. 252, Madagascar.

Three mature and one young individual of this peculiar species have been examined, the former all considerably injured. It is most nearly allied to *L. Japonica* from which it is distinguished by the form and peculiar modification of its perithecium, as well as the relation of the latter to the receptacle and by the monstrous development of cells IV and V of the receptacle.

LABOULBENIA CONCINNA Thaxter. Plate LVIII, fig. 4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 31. June, 1902.

Perithecium opaque, nearly symmetrical, rather long and slender, straight, the lower half slightly inflated; tapering very gradually distally to the broad, truncate often symmetrical tip, which is barely differentiated above an inconspicuous elevation; the flat lip-edges slightly translucent brown: the basal cells forming a well distinguished short hyaline stalk, the curvature of which bends the perithecium away from the appendages at an angle of nearly 45°. Appendages forming a dense rather short slightly spreading tuft, the axis of which is coincident with that of the receptacle, copiously branched, the branchlets unilaterally disposed, rather closely septate; the septa mostly dark brown, except the very numerous paler slightly tapering extremities, which hardly reach the middle of the perithecium. Receptacle subclavate, the basal cell rather large, hyaline narrower below; the cells above yellowish brown, inconspicuously punctate; cells III and IV bulging symmetrically and prominently below the well-defined insertion-cells; cells IV and V separated by a nearly vertical septum. Perithecia, exclusive of stalk, 15–180 × 33–45 μ, stalk 25 × 30 μ. Receptacle 150–185 × 55–65 μ. Appendages (longest) 125 μ. Total length to tip of perithecium 325–375 μ.

On *Casnonia* sp., Buitenzorg, Java.

A small group of mature individuals of this very pretty and distinct species was found on one of several hosts kindly collected for me by Professor H. M. Richards, growing at the tip of the abdomen on the upper side, and conspicuous for their large size and dark color. The tuft of appendages is so dense that it has been almost impossible to determine the exact origin of the main branches. Several of the latter appear to arise in radial series from the basal cell of the outer appendage, and that of the inner appears to give rise as usual, to single branches on either side which are very copiously and closely branched. Although the perithecium is too deeply suffused to determine this point, there seems to be a twist in its wall-cells which makes the anterior and posterior lip-cells lateral in position, and gives the tip its characteristic nearly symmetrical habit.

Laboulbenia imitans Thaxter. Plate LIX, figs. 24–26.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 180. Dec., 1899.

Perithecium free, long, rather slender, curved slightly outward, suffused with dark smoky brown, tapering rather abruptly to a somewhat truncate sometimes neck-like tip, the inner lip-cells darker: the basal cells forming a hyaline well developed neck. Receptacle short, stout, subtriangular, usually abruptly bent above the basal cell, becoming deeply suffused with blackish brown, coarsely and conspicuously punctate, except where quite opaque, the opacity first involving the anterior and lower portions above the hyaline basal cell: cells IV and V nearly equal, cell IV bulging outward, more than half its upper surface being free from and external to the black insertion-cell. Outer appendage consisting of a hyaline basal cell which may become entirely opaque, its upper and outer margins curving evenly inward to form a deeply blackened ridge, from which arises a crest-like series of from three to five, or even six, branches, which are rigid opaque or deeply suffused and several times branched, especially distally; the inner appendage consisting of a much smaller basal cell which gives rise to a branch on either side, the branches laterally divergent, or erect, and similar to the main branches of the outer appendage; the successive cells of all the branches and branchlets, except at the very tips, externally blackened and distinguished by contrasting and more or less prominent black septa. Spores 42 μ long. Perithecium (exclusive of neck) 150–255 × 28–58 μ; the neck 20–60 × 20–32 μ. Total length to tip of perithecium 270–585 μ; to insertion-cell 100–225 μ; greatest width 50–80 μ. Appendages, 45–200 μ.

On *Nycteis* sp., Paris Museum, No. 29, Madagascar. Berlin Museum No. 934, on *Thyreopterus brevicollis* Kl., and No. 935 on *T. sublævis* Casteln., both from Madagascar. On legs, elytra and abdomen.

This species which has very much the appearance of species of *Corethromyces*, is most nearly related to *L. forficulata* and *L. fissa*. In the material obtained in the Berlin Museum from *T. brevicollis*, the individuals are far larger than the original types, almost twice as large, but there seems no doubt as to the identity of the two, although the form of the perithecium and its tip is somewhat different in the Berlin material. On *T. sublævis* a single mature individual was found in which the total length reaches nearly 800 μ; the perithecium 265 × 65 μ, its neck 150 μ; the receptacle but slightly suffused, over 325 μ long and without maculation. The appendages are, however, the same and the form is undoubtedly referable to the present species.

Laboulbenia fissa Thaxter. Plate LIX, figs. 12–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 177. Dec., 1899.

Perithecium three fourths or more free, short and stout, slightly bent toward the appendages, dirty olive-brown becoming deeply suffused with blackish brown except distally just below the tip, which is abruptly distinguished, long, narrow, hyaline below its black distal portion, furcate, the inner fork formed by the upgrowth of one of the inner (right) lip-cells which grows outward and abruptly upward beside the deep black blunt-tipped projection formed by the other three which it may equal in length, though narrower and somewhat paler. Receptacle short, the basal cell largest, pale yellowish or hyaline, of about the same diameter throughout, broader than cell II, which is short, narrow, of equal diameter throughout, hyaline or yellowish at the very base, the rest opaque and indistinguishable from the remainder of the receptacle, which expands abruptly above, and may become opaque, except the upper part of cell IV and cell V. Insertion-cell much narrower than cells IV–V. Outer appendage consisting of several superposed cells, which form a black opaque axis, usually broken off, curved outward, each cell producing a short hyaline or brown edged branchlet distally on the inner side; the inner appendage consists of a smaller basal cell, which gives rise on either side to a branch much like the outer appendage, its main axis less deeply blackened, curving outward on either side of the perithecium, the hyaline branchlets arising from its convex side mostly once branched and sometimes reaching above the tip of the perithecium. Perithecia, average 150 × 48 μ, including the tip, which is about 45 × 18–20 μ. Total length to tip of perithecium 290–300 μ; to insertion-cell 185 μ; greatest width 70 μ. Appendages about 110 μ.

On *Pericallus gutattus* Chev., Paris Museum, No. 78; Brit. Mus. No. 571; Hope Collection, No. 301, Java; Sharp Collection No. 1202. On *P. flavoguttatus* Dej., E. Indies. Hope Coll. No. 279, Type On elytra.

This very peculiar species is well characterized by the unique modification of the tip of its perithecium, which looks like a pair of mandibles. The more slender of the two projections varies somewhat in length, and is not always as erect as is represented in the figures, and the whole tip sometimes has the slightly bulbous habit indicated in fig. 13. The branches of the inner appendage may be erect, as in fig. 13, or strongly divergent on either side, as fig. 12, which also shows the appearance of the fully matured and nearly opaque individual. The species is most nearly allied to *L. separata* and *L. corethropsis.*

Laboulbenia forficulata Thaxter. Plate LIX, figs. 9–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 178. Dec., 1899.

Perithecium free, straight or somewhat curved, slightly inflated, brown except the basal wall-cells which form a mostly hyaline well developed narrow neck-like stalk less than one third as long as the ascigerous portion, the latter tapering rather abruptly at the tip, two of the lip-cells prolonged to form a pair of erect pointed hyaline symmetrical apposed outgrowths which resemble the tips of a pair of shears. Receptacle short, stout, subtriangular, cell 1 hyaline below, forming a short slender usually curved pedicel; the body of the receptacle deeply suffused below with blackish brown, the more deeply suffused portions coarsely punctate with darker spots. The outer appendage consisting of a basal cell from the blackened upper and outer margin of which arise usually three branches in an antero-posterior series, which are curved slightly outward and give rise from their convex side to secondary branches which in turn may bear branchlets in a similar fashion: of the primary branches the inmost is more copiously branched, the outmost being small, usually broken; all the branches black externally and brown on the inner margins, or wholly opaque, usually constricted on the inner side at the blackened septa, the terminal cells of some of the ultimate branchlets abruptly inflated at the base: the basal cell of the inner appendage gives rise to a branch on either side, the two divergent and very similar in character and mode of branching to those of the outer appendage. Perithecium exclusive of neck, 150–200 × 28–38 μ; the neck 35–50 μ long. Total length to tip of perithecium 300–450 μ; to insertion-cell 100–150 μ; greatest width 50–70 μ. Appendages 175–200 μ.

On *Thyreopterus striatus* Guer., Hope Collection, No. 302, Madagascar. On elytra.

This species is very closely allied to *L. imitans* in its general form and the character of its appendages, and is also the nearest known relative of the two large species, *L. palmella* and *L. Kunkeli* which occur on the allied *Mormolyce.* It is distinguished from all other species by the shear-like tip of its perithecium. The material is scanty and the appendages are badly broken in all the adults. Whether the flask-like terminations of the inner appendages represented in fig. 9 are sterile extremities, or peculiar antheridia I am unable to determine, although I am inclined to the former view.

Laboulbenia palmella Thaxter.

This species has been obtained on *Mormolyce phyllodes* in the Brit. Mus. No. 556, Ding Ding Is. and No. 556b, Penang, and in the Berlin Museum No. 975a, Sumatra, on the same host. It appears to be constant in its characters and always separable from the much larger *L. Kunkelii,* which has been again observed on the inferior surface of a specimen of *M. phyllodes* from Sumatra in the British Museum, No. 556.

Laboulbenia corethropsis Thaxter. Plate LIX, figs. 3–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 168. Dec., 1899.

Perithecium relatively large, translucent brown or yellowish brown, generally larger distally through a subterminal external bulge, the tip moderately well differentiated, often bent rather abruptly inward, wholly blackish brown or hyaline in the median line, the inner lip-cells smaller and usually more prominent than the outer, sometimes overlapping them, the whole perithecium free from the receptacle. Receptacle short and rather stout, cells II–IV becoming externally blackish brown, the rest concolorous with the perithecium; cells III and IV rather prominent. Outer appendage becoming wholly opaque, its successive cells indistinguishable as are the basal and insertion-cells, consisting of a blackened axis erect or bent outward, from the inner side of which arise several more or less blackened branches, the basal portion of the appendage only, as a rule, remaining. The inner appendage, consisting of a basal cell which is usually indistinguishable from the insertion-cell, being quite opaque, producing a branch on either side, the axis of the branches erect, becoming blackened and opaque, except the inner margins of the distal cells, bearing externally from six to ten or even more branchlets which are more or less deeply suffused. Perithecium 130–150 × 30–33 μ. Total length to tip of perithecium 190–240 μ; to insertion-cell 90–130 μ. Greatest width 40–50 μ. Appendages longest (broken) 185 μ.

On inferior surface of abdomen, and on elytra of *Miscelus Javanus* Klug., Hope Collection, No. 304, Java; on *Miscelus* sp., Paris Museum, No. 114, New Guinea.

This somewhat variable species occurs on the elytra and abdomen of its host. Its small receptacle and relatively large perithecium, together with its peculiar appendages, give it, like the allied *L. imitans*, a general habit which strongly suggests some species of *Corethromyces*. The main axis of the outer appendage, as well as the main branches of the inner, appear to result from successive proliferation and may be quite opaque. The species is very closely allied to *L. Misceli* from the Moluccas, which may prove merely a paler variety. The figures represent specimens from the type slide on *M. Javanus* from Java.

LABOULBENIA MISCELI Thaxter. Plate LIX, figs. 19–20.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 189. Dec., 1899.

Perithecium free, long and slender, translucent, pale brownish olive, slightly narrowed at the base to form a short paler stalk which lies opposite the insertion-cell; the tip long, not very abruptly distinguished, paler below, straight or turned slightly outward, distally blackened on the inner side; the lips variable, rather prominent. Receptacle rather short and stout, darker olive-brown; the basal cell pale yellowish. Insertion-cell nearly as broad as cells IV–V. Basal cell of outer appendage blackish brown externally, bearing a single terminal branch of less diameter, externally suffused with blackish brown, slightly curved outward and bearing two or three branchlets from the inner side which are hyaline, their basal cells somewhat suffused with brown; the basal cell of the inner appendage smaller than that of the outer, nearly hyaline and bearing a branch on either side similar to the outer appendage; both the appendages and their branches erect, subappressed. Perithecia including base 145–180 μ. Total length to tip of perithecium 240–300 μ; to insertion-cell 90–130 μ; greatest width 35–40 μ. Appendages, longer 150 μ.

At base of posterior legs of *Miscelus* sp., Paris Museum, No. 114 bis, Isles des Moluques.

This species is too closely allied to *L. Corethropsis*, of which it will probably prove to be merely a variety. It differs in its paler color, and erect and unsuffused appendages, which are however, very similar in structure. The general appearance of the two is distinctly different and they are kept apart provisionally until more and better material of both forms can be examined.

LABOULBENIA SEPARATA Thaxter. Plate LIX, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 200. Dec., 1899.

Perithecium pale olivaceous, the inner margin convex, the outer nearly straight; the tip rather abruptly distinguished, blackened, but not uniformly, below the inner lip-edges which are prominent, olivaceous, translucent, the right inner lip prolonged to form a slender nearly hyaline finger-like projection, the tip of which is blunt and somewhat swollen. Receptacle relatively large dull olivaceous, cells, II, III, and IV sometimes becoming blackish brown externally, cells III and IV rather large; the insertion-cell close to the base of the perithecium, half as broad as cells IV and V. Outer appendage curved strongly outward, opaque and indistinguishable from the insertion-cell, bearing three or four branches from its convex side which are mostly once branched; the inner appendage consisting of a small basal cell, bearing a branch on either side externally blackened, somewhat curved outward, and bearing three or four branchlets which are curved toward the perithecium, externally or wholly brownish toward the base. Perithecia 100–110 × 25–30 μ. Total length to tip of perithecium 220–260 μ; to insertion-cell 130–165 μ; greatest width 55 μ. The prolongation of the lip-cell extending about 20 μ or more beyond the tip of the perithecium.

On *Pericallus guttatus* Chev., Brit. Mus. No. 571, Java. Margins of elytra.

This well marked species is allied to *L. corethropsis* and *L. fissa*, the general characters of the appendages being similar in all three species. The conformation of the tip of the perithecium in the present species, with its obliquely projecting finger-like outgrowth, as well as its general form, large receptacle, and small perithecium, serve abundantly to distinguish it. On the other hand it appears to be allied to *L. Coptoderæ* from Mexico, figured in my Monograph, as are also the two other species above mentioned.

LABOULBENIA INSIGNIS Thaxter. Plate LXI, fig. 2.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 43. June, 1902.

Perithecium free except the base, straight, nearly symmetrical, brown, translucent or transparent, paler below; the wall-cells spiral, describing about half a turn from the base to the tip, which is abruptly distinguished, nearly symmetrical, abruptly opaque below the broadly subhyaline, faintly brownish lips, which are not prominent and form a somewhat angular-truncate or very slightly oblique apex. Distal and basal portions of the receptacle very thick-walled, punctate, abruptly distinguished; the basal cell hyaline or faintly reddish brown, nearly parallel with the perithecium; the subbasal cell larger and longer, more or less prominently and gradually constricted toward the middle; the straight anterior margin of the distal portion of the receptacle abruptly divergent and formed by cell VI and the secondary stalk-cell, both of which become deeply suffused with black brown, except the base of cell VI which is concolorous with the subbasal cell, from the upper half or less of which it is obliquely separated: cell III and IV subequal and separated by a slight constriction, faintly brownish or subhyaline, their margins slightly convergent toward the thick, jet black, constricted, slightly oblique insertion-cell; the inner margin of which is free from the base of the perithecium. Basal cell of the outer appendage squarish or slightly longer than broad, bearing above its outer upper angle a single opaque contrasting short branch (broken in the types but evidently bearing several branchlets); the basal cell of the inner appendage somewhat smaller, bearing a branch on either side; each branch thrice closely branched, their short basal cells, which are subhyaline or faintly reddish brown, each successively bearing two or three divergent stout branchlets; the series ending in branchlets of the fourth or fifth order, which are deep brown, slender, stiff, divergent, thirty or more in all. Spores 185 × 6.5 μ. Perithecia 290–310 × 80–87 μ. Receptacle 365–540 × 150 μ. Appendages (broken) 220–250 μ or more. Total length to tip of perithecium 600–650 μ.

On inferior thorax of *Thyreopterus brevicollis* Kl., Madagascar; Berlin Museum, No. 934.

One of the largest and finest species of the genus, the three mature specimens examined being in good condition except that the tips of the ultimate branchlets are broken in all cases. As far as can be determined from the specimens, one of which is quite young, the basal cell of the outer appendage bears only a single opaque branch, all the rest belonging to the inner appendage. Its relationships to other species are not evident and it is placed provisionally near *L. palmella* and *L. forficulata*, both of which occur on allied hosts.

Laboulbenia Lebiæ nov. sp. Plate LXI, figs. 3–4.

Perithecium faintly olivaceous, deeper below; the cells at or about its base more deeply suffused, especially externally, and more or less distinctly elevated above the surrounding surface; the body of the perithecium tapering more or less evenly and considerably to the tip, which is not abruptly distinguished except by its contrasting blackish color, and is usually turned strongly outward and somewhat sidewise, the translucent lip-edges external, olivaceous. Receptacle rather long and slender, tapering gradually from the distal region to the base; dirty olivaceous yellow; cell III distally, and cell IV almost wholly, suffused with olive brown, the latter prominent below the black insertion-cell; cell III slightly longer than cell VI which lies erect beside it. The outer appendage consisting of a somewhat incurved series of about three obliquely superposed cells, the basal large, externally suffused with olive-brown, the rest successively smaller, yellowish, all bearing distally a branch from a nearly horizontal base, the branches mostly once or more branched and more or less deeply suffused; the inner appendage consisting of a basal cell somewhat smaller than that of the outer, which bears on either side a branch somewhat similar to the outer appendage: the whole forming a dense tuft of branches mostly opaque or deeply suffused with olivaceous brown, and strongly curved toward, or partly across, the perithecium. Perithecium 165 × 50 μ. Appendages, longest 125 μ. Receptacle 360 × 60 μ. Total length 500 μ.

At the base of the posterior legs of *Lebia* sp., Java, Rouyer, No. 1398.

A smaller form, which cannot be separated from this species, occurs on the legs of the host (fig. 4), and differs in the blunt straight tip of its perithecium, the absence of dark suffusions, except in the appendages and at the tip of the perithecium, in its ill developed appendages, and in the greater prominence of the cells about the base of the perithecium. The latter character is one which distinguishes this species from any other known to me, and the type form represented in fig. 3, can hardly be confused with any other. It appears to be somewhat allied to *L. insignis*, but not at all closely.

Laboulbenia Australiensis Thaxter.

Additional material of this species on *Acrogenys hirsuta* from Australia has been obtained from the British Museum No. 668 and from the Berlin Museum No. 943. The branches of the appendages appear to be very brittle, and in most of the adults are so broken that their true character is obscured. The variable basal cell of the outer appendage, unlike those of the specimens figured in my Monograph, is apt to be more or less completely and deeply suffused, and in general gives rise to an outer and an inner branch; the inner hyaline and usually furcate above its basal cell; the successive cells of the main axis of the outer, about three in number, more or less deeply suffused, especially externally, each giving rise distally, sometimes from both the inner and outer angles, to rigid branchlets, which may be simple or, especially in the lowest, commonly bear several secondary branchlets which grow upward. This type of branching seen in the outer appendage is unusual, and the species is well distinguished.

Laboulbenia prominens Thaxter. Plate LIX, fig. 14.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 195. Dec., 1899.

Perithecium short and stout, less than half free from the receptacle, nearly opaque blackish brown lighter distally, the short broad blunt black tip rather abruptly distinguished on the inner side. Receptacle rather stout, cells I and II dirty yellowish or subhyaline, the rest more or less deeply suffused with blackish brown; all the cells except cell I marked by fine transverse striations more distinct on the suffused portions; cells III and IV large and prominent, the insertion-cell broad but narrower than cells IV–V. Outer appendage consisting of a short irregular cell abruptly prominent externally above the insertion-cell, narrowed distally and bearing two branches antero-posteriorly, the outer externally deep blackish brown, once branched, its outer branchlet blackened and also branched, the inner consisting of a short basal cell which bears an inner and an outer branchlet, all the branchlets pale brown, except the outermost which is blackened, curved outward: the inner appendage consisting of a basal cell smaller than that of the outer, irregular and bearing a branch on either side; each once branched, the branchlets like those of the outer appendage. Perithecia 150 × 52 μ. Total length to tip of perithecium 310–330 μ; to insertion-cell 275 μ. Greatest width 95–100 μ. Spores 75 × 7 μ.

On *Pericallus guttatus* Chev., Brit. Mus. No. 571, Java. On legs.

A stout species, the form of which is similar in general to that of *L. Maylayensis* the distal part of the receptacle (cells III–V) being as large as the whole remainder. The appendages are, however, quite different, as is the form and position of the perithecium. But two specimens of the species have been examined, in both of which the tips of the ultimate branchlets of the appendages are broken.

LABOULBENIA DISTINCTA Thaxter. Plate LIX, figs. 15–16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 172. Dec., 1899.

Perithecium short and broad, wholly united to the receptacle except the tip, clear dark brown, darker distally, the tip large, blackish, somewhat compressed, the lips translucent smoky brown, not prominently distinguished. Receptacle short and stout, the distal portion larger than the basal; cells I, II, and VI transparent yellowish, the rest smoky brown, marked by closely set fine transverse lines; cells III and IV relatively very large, subequal. Insertion-cell two thirds as broad as cells IV–V. Outer appendage consisting of four superposed cells, the three lower flat and subequal; the second subbasal, and third bearing single simple or once branched upcurved branches from their inner sides; hyaline becoming dark brown, the two lower larger and nearly equal, the uppermost cell much smaller almost opaque producing a similar branch from its inner side and a terminal branch which is deep brown curved outward and upward, slender, simple; the inner branches of the three cells all at first hyaline, mostly once branched; later developing a dark brown contrasting suffusion above their basal cells: the inner appendage consisting of a small basal cell producing a branch on either side, the basal cell of which is larger than that of the appendage, and bears two branchlets basally suffused with brown like those of the outer appendage. Perithecia 130 × 50 μ. Total length to tip of perithecium 275 μ; to insertion-cell 250 μ; greatest width 95 μ. Appendages, longest 235 μ.

On margin of elytra of *Pericallus cæruleovirens* Tat., Brit. Mus. No. 570, Singapore.

The appendages of this very distinct species are quite different from those of any described form. The receptacle is somewhat similar to that of *L. prominens*, cells III and IV being relatively very large, each bulging prominently, but separated by a marked constriction. Two mature specimens only have been examined. The tip of the branch at the extreme left in fig. 15, has been supplied, being broken in the adult specimens, though present in the young, fig. 16.

LABOULBENIA ACANTHOPHORA Thaxter. Plate LVI, fig. 14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 27. June, 1902.

Pale smoky brown. Perithecium relatively very large and elongate, the lower wall-cells forming a well-developed stalk, slightly narrower and paler than the main body which is very long, straight, but slightly inflated; the tip stout, more deeply suffused, well differentiated; one of the lip-cells forming a median, terminal, erect, slightly curved and tapering, blunt-tipped, dark brown projection, the lower half broader, the whole more than twice as long as a similar second outgrowth which, arising near its base, curves outward on the right side (the perithecium being considered anterior). Basal cell of receptacle subhyaline, more than twice as long as broad, the subbasal subisodiametric, darker brown than the other cells; cells III and VI subequal, lying perpendicularly side by side, both several times longer than broad; cell IV about as long as cell III; cell V small, obliquely separated. Insertion-cell black, well defined. Outer appendage (broken) simple (?) its basal cells blackened; the branches curved outward, externally blackened below, and giving rise above to several successive branchlets. Spores 75 × 4.5 μ. Perithecium (main body) 220 × 50 μ; stalk 60 × 30 μ; terminal appendage 60 μ. Receptacle 220 × 65 μ. Appendages (broken) 150 μ. Total length to tip of perithecium 580 μ.

On the elytra of *Pericallus* sp.; Sharp Collection, No. 1202; East Indies.

The general habit of this species, which is represented by a single type specimen, is peculiar. The perithecium is much longer than the receptacle, which is shaped like a butter-spat, cell I forming the handle, cell II being somewhat abruptly broader, and cells III and VI being almost paired. The species is most nearly related to *L. ceratophora*, from which it differs, however, in numerous important points which are too obvious to need enumeration.

Laboulbenia ceratophora Thaxter. Plate LX, figs. 32–35.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 163. Dec., 1899.

Perithecium wholly free, borne on a short nearly hyaline stalk, slightly tinged with brown, for the most part nearly straight, rather slender, hardly inflated, the outer margin usually slightly concave; tapering slightly and rather abruptly to the peculiarly modified tip; the tip black, except externally immediately about the pore, a large broad tooth-like prominence projecting inward, the upper surface of which is nearly horizontal; while it is continued upward and outward above and beyond the lateral pore into a longer more slender, finger-like, bluntly tipped outgrowth, the lower or external margin of which may be partly hyaline. Receptacle yellowish tinged with brown distally, where it is rather abruptly, but slightly, broader above cell II, cell IV small and hardly longer than cell V, cells III and VI subequal. Insertion-cell opposite the distal extremity of the short perithecial stalk. The basal cell of the outer appendage longer and narrower than that of the inner, becoming concolorous with the insertion-cell, bearing a single branch of usually three cells more or less deeply tinged with brown, each of which may give rise distally on the inner side to a short simple branchlet: the inner appendage consisting of a basal cell shorter and broader, which usually bears distally on either side a branch, the basal cell of which usually bears distally two erect simple branchlets, one of them sometimes replaced by a single large long-necked brown antheridium. Perithecia, including the stalk (17 μ), 150–155 × 30 μ. Total length to tip of perithecium 290–310 μ; to insertion-cell 150 μ; greatest width 35 μ. Appendages, longer 200 μ.

On *Serrimargo guttiger* Schaum, Hope Collection, No. 300, Sumatra; on *Miscelus Javanus* Klug., Hope Collection, No. 303, Java; on *Miscelus* sp., New Guinea, Paris Museum, No. 113 Type. On elytra and inferior surface of the prothorax.

A well marked species, nearly allied to *L. Javana*, from which it is distinguished by the conformation of the tip of its perithecium, as well as by other differences which appear to be constant in the material examined, and are sufficiently indicated in the accompanying figures.

Laboulbenia Assamensis Thaxter. Plate LX, figs. 36–39.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 159. Dec., 1899.

Perithecium rather long and slender, usually straight and erect, free except at its very base, evenly suffused with dark slightly reddish brown, paler distally, tapering very slightly and gradually to the not abruptly differentiated tip which is somewhat rounded, slightly bent inward and suffused with blackish brown; the left lateral lip-cell prolonged to form a blackish blunt-tipped prominent outgrowth, which is either erect or bent slightly outward or inward. Receptacle dirty brownish yellow, punctate with fine rather indistinct transverse striations, cell V very small, often hardly visible against the perithecium. Appendages concolorous with the receptacle, the outer simple, straight, rigid, mostly somewhat divergent; the inner consisting of a basal cell often as large as that of the outer, and giving rise on either side distally to a branch similar to the outer appendage which bears several lateral antheridia near the base. Perithecium (including outgrowth 18 μ) 185–190 × 33–37 μ. Total length to tip of perithecium 375–450 μ; to insertion-cell 185–300 μ; greatest width about 48 μ. Appendages, 150 μ.

On *Catascopus*? sp., Brit. Mus. No. 663, Assam, India. Inferior surface.

Allied to *L. tenuis*, in which the appendages are very similar, and to *L. Sumatræ*, *L. Javana* and *L. ceratophora*; although the conformation of the perithecial tip is quite different from either. The material is sufficient and in good condition.

Laboulbenia Javana Thaxter. Plate LX, figs. 17–20.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 182. Dec., 1899.

Perithecium about two thirds or less free, sessile, tinged with brown, paler in the middle, the distal portion hyaline and tapering considerably to the greatly modified tip, which is deeply suffused with blackish brown and bears two often symmetrically placed divergent outgrowths, the inner broader at the base and much shorter than the outer which is finger-like, with a hyaline area above, close beside the subterminal pore: the outer of these two projections appears, through a twist in the perithecium, to lie on the inner side. Receptacle pale yellowish with brownish shades, the deeply suffused base of the perithecium opposite the upper half of cell III or lower; the distal portion usually so twisted and bent in conjunction with the perithecium that it crosses the latter and the appendages at a considerable angle. Insertion-cell higher than the middle of the perithecium. Appendages concolorous with the receptacle, the outer simple, consisting of a basal cell, large, long, usually more or less suffused, and distally slightly geniculate so that the remainder of the appendage is bent abruptly toward the perithecium, the basal cell of the inner appendage smaller, bearing a single branch on either side which may be once branched. Perithecia about 100 μ long, exclusive of outgrowth, 27 μ broad. Total length to tip of perithecium 190 μ; to insertion-cell 140 μ. Appendages 130 μ. Distance from tip to tip of perithecial outgrowths 45–48 μ.

On *Pericallus cicindeloides* MacLeay, Paris Museum, No. 143, Tongou, Java. On inferior surface of thorax.

This curious form is chiefly remarkable for the peculiar conformation of the tip of its perithecium, the outgrowths from which are more highly developed than they are in any of the other terrestrial forms. It is most nearly related to *L. Sumatræ*, in which the tip of the perithecium is somewhat similar, though less peculiarly developed.

LABOULBENIA SUMATRÆ Thaxter. Plate LX, figs. 13–16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 203. Dec., 1899.

Perithecium small, pale amber-colored, darker and somewhat inflated below, tapering distally; the tip, only, free from the receptacle, not distinguished from the body of the perithecium, long, nearly hyaline below, the lip-cells abruptly spreading, contrasting, black except about the pore and peculiarly modified, the two outer broadly rounded, the two inner developing outgrowths which grow inward and upward; that on the right side longer than the left, narrower and indented near the base on the inner side. Receptacle concolorous with the perithecium, paler below, marked by faint fine transverse striations. Appendages concolorous with the receptacle, the outer simple, stiff, curved slightly outward, the inner consisting of a basal cell smaller than that of the outer and bearing on either side a branch which may be once branched at the base. Perithecium 92 × 22 μ. Total length to tip of perithecium 200 μ; to insertion-cell 166 μ. Appendages about 185 μ.

At base of anterior legs of *Catascopus cupripennis* Thoms., Hope Collection, No. 291 Borneo, No. 299 Sumatra.

This little species is intermediate between *L. tenuis* and *L. Javana*, approaching the latter very closely, though differing in the peculiar conformation of the tip of the perithecium and the relation of the latter to the receptacle, which is normal in form, and undistorted. The outer appendage also differs in being straight, with a relatively smaller basal cell.

LABOULBENIA MEGALONYCHI Thaxter. Plate LVIII, fig. 2.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 46. June, 1902.

Hyaline, becoming very faintly tinged with yellowish brown. Perithecium about one half or more free, slightly divergent, short, stout, tapering slightly from the broad basal half to the tip; which is, as a rule, bent abruptly inward, rarely outward, or erect, rather small and well-distinguished by its long external contrasting broadly blackened margin, and by a shorter broadly blackened area below the small, prominently rounded inner lips; the lip-edges horizontal, or nearly so. Receptacle rather long and slender; cells I and II of nearly equal diameter, the latter large; while between it and cell III and VI the receptacle may be abruptly and strongly twisted; cells III and VI subequal, the former higher; cell IV slightly smaller; cell V relatively large, the inner half or less of its inner margin free between the perithecium and the broad, thick, black contrasting insertion-cell. Outer appendage consisting of three superposed, distinctly brown, successively smaller cells, each nearly twice as long as broad; each of the two lower producing distally from its inner side a simple hyaline abruptly erect branch, the terminal one bearing two such branches distally. Basal cell of the inner appendage half as large as that of the outer, bearing on each side a branch which bears one or more branchlets and, bending across the outer appendage, is often characteristically recurved beyond it. Spores 58 × 5 μ. Perithecia 100–125 × 40–50 μ. Receptacle 275–360 μ. Appendages 185 μ. Total length to tip of perithecium 300–435 μ.

On the right inferior prothorax of *Megalonychus patrobioides*, Chincoxo, E. Africa; Berlin Museum, No. 1037; on *M. Angolensis* Harold, No. 1039.

A species well distinguished in all its characters and not closely related to any other. The material on *M. Angolensis* is all immature, but undoubtedly belongs to this species.

LABOULBENIA OBLIQUATA Thaxter. Plate LVIII, fig. 3.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 48. June, 1902.

Color pale amber-yellow. Perithecium almost wholly free, distally bent abruptly outward or almost recurved; the base slightly inflated; tapering somewhat, distally, to the apex; the tip hardly distinguished, irregularly bent or twisted; the asymmetrical lip-cells forming irregular projections, the two inner subtended by unequal dark patches. Subbasal cell of the receptacle somewhat longer than the basal, nearly as broad as the distal portion of the receptacle; cells III and VI subequal; cell IV subtriangular; cell V broad and short, carrying the thick contrasting black insertion-cell out free from the perithecium. Outer appendage simple (or distally branched?), slightly divergent; the basal cell somewhat inflated, abruptly broader than the subbasal cell, its basal third or more obliquely involved by the opacity of the insertion cell: the basal cell of the inner appendage similar to that of the outer, without suffusion, bearing a short branch on either side, each of which may bear several branchlets. Spores 45 × 3.5 μ. Perithecia 165–170 × 40 μ. Receptacle 185–200 × 45 μ. Total length to tip of perithecium 325–360 μ.

On elytra of *Coptodera gagatina* Dej., Brazil; Berlin Museum No. 978.

This species is distinguished by the abrupt curvature of its perithecium, the peculiar modification of the tip of the latter, and the oblique black suffusion of the basal cell of the outer appendage, which is continuous with the opacity of the insertion-cell, and contrasts strongly with the otherwise general pale yellowish color. It appears to be more nearly allied to the group of forms on *Pericallus* and allied hosts of the East Indies.

LABOULBENIA TENUIS Thaxter. Plate LX, figs. 24–26.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 204. Dec., 1899.

Perithecium relatively small and narrow, dull amber-yellow to brown, the upper half or more free from the receptacle, tapering somewhat distally, curved toward and partly across the appendages; the tip not well distinguished, broad, its distal margin often concave, the lips projecting slightly on either side, the lip-cells black, except about the pore. Receptacle slender, amber-yellow, becoming tinged with brown especially distally, strongly curved throughout, the concave side anterior. Insertion-cell black and thick, narrower than cells IV and V. Appendages straight and rigid, the outer usually simple, its basal cell large bulging and blackened externally, much larger than that of the inner appendage which gives rise to a branch on either side with short antheridial branches near the base. Perithecia 90–130 × 22–26 μ. Total length to tip of perithecium 250–500 μ; to insertion-cell 425–185 μ. Greatest width 37–55 μ. Appendages more than 200 μ (broken).

On *Miscelus Javanus* Klug., Hope Collection, No. 308, Java; on *Miscelus* sp., Paris Museum, Nos. 114 and 115, New Guinea; on *Catascopus* ? sp. Brit. Mus. No. 663, Assam India. On the elytra and inferior surface.

This species is well distinguished by its subfalcate habit, the whole plant being evenly curved from base to tip, the small narrow perithecium with its broad obtuse tip lying against the straight appressed appendages. The receptacle is relatively long and slender, and faintly punctate. The material from Assam (fig. 26) though much larger and darker than the type form from New Guinea (figs. 24–5), is otherwise identical with it. The species appears to be allied to *L. subconstricta*, *L. aristata*, and several others of the numerous and varied forms which occur on these and other nearly related genera of East Indian Carabidæ. The maximum measurements given above apply to the form on *Catascopus*.

LABOULBENIA SUBCONSTRICTA Thaxter. Plate LX, figs. 30–31.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 203. Dec., 1899.

Perithecium less than one half free, rather small, curved strongly and evenly toward the appendages, evenly suffused with dark brown or lighter distally; the tip black, not abruptly distinguished, the lips distinct with a broad hyaline margin about the pore. Receptacle dull amber-yellow, cells IV and V, sometimes cell III, less deeply suffused with brown; cell I narrow, straight, but slightly enlarged distally; cell II abruptly much larger, symmetrically and prominently constricted in the middle; cells III and IV relatively, large and broad. Outer appendage simple, the basal cell moderately large; externally or wholly blackened; the rest of the appendage straight, rigid, directed across the tip of the perithecium: inner appendage consisting of a smaller basal cell which bears one or two branches similar to the outer appendage. Perithecia 85 × 25 μ. Total length to tip of perithecium about 200 μ; to insertion-cell 165 μ; greatest width 50 μ. Appendages, broken, about 150 μ or a little more.

On *Catascopus* sp., Paris Museum, No. 116, New Guinea. On anterior inferior margin of thorax on the right side.

This species is very closely allied to *L. tenuis*, but differs in its short stout perithecium, and in the peculiar form of its receptacle, which does not vary in the five types.

LABOULBENIA EUCHILÆ Thaxter. Plate LV, fig. 13–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 36. June, 1902.

Slender, nearly uniform pale dirty yellowish throughout. Perithecium relatively small with a faint brownish tinge, about four fifths free, erect, straight; the tip fairly well distinguished, the inner lip-cells large, prominent, rounded, the lip-edges outwardly oblique. Receptacle slender and long, punctate; the subbasal cell much longer than the basal, nearly isodiametric, or swollen above the basal cell and broader than the distal part of the receptacle, which is separated from its distal end by a prominent constriction; cells III and VI subequal, or cell III larger; cell V very small; cell IV longer than broad, becoming externally tinged with brownish. Insertion-cell relatively thick, free, narrow. Appendages becoming wholly dark brown, in contrast to the rest of the plant; the outer simple, or once furcate above the third cell; the basal cell more than twice as long as broad; the basal cell of the inner appendage less than one half as large as that of the outer, bearing a usually simple branch on either side, which bears single antheridia near its base. Spores 60 × 4.5 μ. Perithecia 100 × 30 μ. Receptacle 220–250 × 35–40 μ. Appendages 150 μ. Total length to tip of perithecium 300–350 μ.

At the base of the anterior legs of *Euchila flavilabris* Dej., Brazil; Berlin Museum, No. 938.

This pale dirty brownish yellow, evenly colored species is well distinguished by the peculiar conformation of its receptacle; cell II being greatly enlarged, and the receptacle immediately above it distinctly narrowed, forming a constriction. The appendages become very dark contrasting brown; but in all the specimens examined, which are sufficiently numerous, though not in the best condition, the perithecium remains concolorous with the receptacle and without dark shades.

LABOULBENIA TUBERCULIFERA Thaxter. Plate LX, figs. 1–3.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 208. Dec., 1899.

Perithecium deeply suffused with smoky brown, free except the lower fifth; the tip not abruptly distinguished, nearly black, the distal margin somewhat oblique, mostly straight with an outer more or less ill defined tooth-like prominence; in general variable, the lip-cells not prominent. Receptacle rather long and slender, cell I quite hyaline below, distally tinged with deep brown and coarsely punctate; cell II tinged with brown and punctate below with scattered black-brown dots, otherwise nearly hyaline, except a series of deep brown short tubercular transverse ridges on one side of cell IV, and the basal cells of the perithecium which are deep brown, the rest subhyaline, cell IV bulging. Outer appendage simple, slender, the basal cell sometimes long and somewhat inflated: the inner appendage consisting of a small basal cell with a short branch on either side. Perithecia about 140 × 50 μ. Total length to tip of perithecium, average 340 μ; to insertion-cell, average 225 μ; greatest width 60 μ. Appendages 225 μ (longest).

On *Serrimargo guttiger* Schaum., Brit. Mus. No. 558, Penang, East Indies. On base of elytra.

This species is closely allied to *L. leucophæa* and *L. corrugata*, being the least characteristic of the three. It is distinguished from *L. leucophæa*, which it most nearly resembles in the relation of its perithecium to the receptacle. The short basal cell of the latter, the punctation of the subbasal cell in connection with its suffusion, and in the very differently shaped perithecial tip, which is without any finger-like projections.

LABOULBENIA LEUCOPHÆA Thaxter. Plate LX, figs. 9–11.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 183. Dec., 1899.

Perithecium dark brown, almost opaque, rather small, hardly more than the tip free from the receptacle; the tip relatively large and long, bent slightly outward, not abruptly differentiated, black except around the pore, the right inner lip forming a hyaline nearly median blunt outgrowth which is bent slightly outward. Receptacle sometimes twisted at the distal end of and above cell II; cell I hyaline; cell II suffused with brown, in some cases with deeper brown transverse elevations on one side; the lower half of cell III and cell VI hyaline, the rest of the receptacle concolorous with the perithecium. The outer appendage simple, its basal cell four or more times as long as broad, curved toward the perithecium; the basal cell of the inner appendage very small, bearing in general a single short branch, both appendages pale yellowish. Perithecium to tip of outgrowth 130–150 × 35–40 μ. Total length to tip of perithecium 325–375 μ; to insertion-cell 250–290 μ; greatest width 55–65 μ. Appendages about 200 μ.

On mid-elytron and base of legs of *Serrimargo guttiger* Schaum., Hope Collection, No. 300, Sumatra.

This species is closely allied to *L. corrugata* and *L. tuberculifera*, but differs from both in the relation of its perithecium to the receptacle, and the conformation of the tip. Of two original preparations one has unfortunately been destroyed, so that the species is represented by two individuals only.

LABOULBENIA CORRUGATA Thaxter. Plate LX, figs. 6–8.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 168. Dec., 1899.

Perithecium rather small, irregular, free from the receptacle except at the base, blackish brown, darker and almost opaque below, a rounded distal elevation extending completely around the perithecium, broader externally, forming a nearly opaque broad collar, above which the tip is very abruptly distinguished; the latter subhyaline basally, a dark median external and internal suffusion, the lips translucent, faintly brownish, the two outer rounded and curved inward between the two inner, which form two free slightly unequal divergent blunt-pointed projections. Receptacle rather long and slender, pale brownish yellow with deeper brown suffusions about the distal region of cell I and the basal region of cell II; the basal cells of the perithecium opaque and cell IV and V more deeply suffused; a series of prominent blackish brown tuberculate ridges extend more than half way across the receptacle from the anterior margin, beginning below the insertion-cell and extend as far as the base of cell II, cell IV bulging distally outside the thick rather narrow insertion-cell. Outer appendage simple, erect, tapering, yellowish; inner appendage consisting of a smaller basal cell with a similar and shorter branch on either side. Perithecia 120 × 37–40 μ. Total length to tip of perithecium 340 μ; to insertion-cell 200 μ; greatest width 60 μ. Appendages 185 μ.

On base of the elytron of *Serrimargo guttiger* Schaum., Hope Collection, No. 300, Sarawak, Borneo.

This species, although closely allied to *L. tuberculifera* and *L. leucophæa*, is readily distinguished from either by the peculiar conformation of the distal portion of the body of its perithecium, as well as by the two ear-like processes from its rounded tip. The tuberculars corrugations are also more prominent and differently placed. Two mature specimens, only, have been examined.

LABOULBENIA NOTATA Thaxter. Plate LVI, fig. 13.
Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 47. June, 1902.

Perithecium straight, erect, hardly more than the tip free, almost or quite opaque distally, paler below; covered with scattered wart-like protuberances; the tip abruptly distinguished, opaque, separated from the body of the perithecium by a subhyaline zone; the apex broadly hyaline, truncate, somewhat angular. Receptacle elongate throughout; the basal cell relatively small, dark brown, somewhat contrasting, the rest pale brownish yellow to dark brown; distally more or less conspicuously marked by scattered brown warts; cell VI very long and slender, overlapping cell II for some distance, the cells above it also unusually elongate; cell III very long and slender, separated from cell II by a narrow horizontal septum; cell V relatively small. Insertion-cell somewhat oblique, thick, black, not abruptly narrower than the cells below it. Outer appendage simple, short, the basal cell several times longer than broad, the remainder more slender, brown, contrasting with the basal cell. Inner appendage consisting of a basal cell more than half as long as that of the outer, bearing distally on either side a short simple branch similar to the outer appendage but paler. Perithecia 271 × 55 μ. Receptacle 1100 × 75 μ. Appendages about 185 μ. Total length to tip of perithecium 1150 μ.

On *Thyreopterus armatus* Cast., Madagascar; Berlin Museum, No. 933.

A very peculiar, coarsely warted form, evidently related to the other members of the series with simple outer appendages, which occur on hosts of this and of allied genera. A single full grown individual only has been examined which is illustrated in fig. 13.

LABOULBENIA PROTRUDENS Thaxter. Plate LIX, figs. 7–8.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 196. Dec., 1899.

Perithecium smoky brown with a tinge of olive, the outer margin concave, relatively small; the tip, only, free from the receptacle, short, broad, subtruncate not abruptly differentiated, bent slightly outward, black except around the pore. Receptacle dirty olivaceous, faintly punctate above cell I which is, except at the base, concolorous with perithecium; cells IV and V forming a somewhat angular protrusion which carries the insertion-cell out free from and beyond the tip of the perithecium. Insertion-cell less than half as broad as the adjacent distal margins of cells IV and V, which form a flat surface in which the insertion-cell is mostly central. Outer appendage arising from a small roundish basal cell, simple or once branched, the branches short, tapering, nearly hyaline; the basal cell of the inner appendage very small, bearing one or two short tapering hyaline branches. Perithecia 95–110 × 34 μ. Total length to tip of perithecium 280 μ; to insertion-cell about the same measurement; greatest width 66 μ.

On *Pericallus cicindeloides* MacLeay, Paris Museum, No. 144, Tongou, Java. On mid-elytron.

The general appearance of this species, owing to the peculiar relation of the perithecium and receptacle, recalls that of *L. Schizogenii* and *L. Morionis*. The character of the appendages makes it seem probable that it is allied to some of the simpler forms which occur on this and on related hosts, as for example *L. aristata*, *L. tenuis*, *L. Maylayensis* etc., rather than to forms of the "*Clivinæ*" group.

LABOULBENIA MALAYENSIS Thaxter. Plate LIX, figs. 17–18.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 185. Dec., 1899.

Perithecium clear translucent brown with a slight olive tinge, becoming almost opaque; united to the receptacle, except the abruptly distinguished tip which is hyaline, all but the blackened lips; the latter turned abruptly usually to the right, forming a lateral somewhat irregularly four-lobed papilla in which the hyaline pore is central. Cells I and II of the receptacle about equal in length, nearly hyaline, often distally olivaceous; cells III and IV relatively large, translucent olive-brown, cell IV bulging distally so that the dark but not opaque insertion-cell is turned obliquely toward the tip of the perithecium; cells

VI and the basal cells of the receptacle more or less tinged with olive-brown forming an elevation so that the perithecium appears indented below, all the cells except cell I marked by fine transverse striations. Outer appendage simple, the basal cell rather large, often externally indented near the base, the second and third cells nearly equal, narrower than the basal cell and the cells immediately above them; the rest of the appendage tapering to the hyaline attenuated elongate distal portion; the inner appendage consisting of a basal cell one third as large as that of the outer and bearing a single branch on either side, one or both of which may be elongate much like the outer appendage, bearing one or two short slender antheridial branches near the base, which are bent rather abruptly upward from their point of origin; the branches all distally hyaline and attenuated; the basal cells faintly reddish. Perithecia, average 110 × 37 μ. Total length to tip of perithecium 260–280 μ; to insertion-cell 250–275 μ; greatest width 75 μ. Appendages, longest 375 μ.

At base of posterior legs of *Pericallus cœruleovirens* Tat., Brit. Mus. No. 570, Singapore.

This species is well defined by its general form, the relation of the perithecium to the receptacle, and the conformation of the outer appendage, which is similar to that of *L. aristata*; but especially from the peculiar conformation and twist which characterize the tip of the perithecium. The four mature specimens examined are all in good condition and show no variation.

Laboulbenia aristata Thaxter. Plate LX, figs. 27–29.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 158. Dec., 1899.

Perithecium less than one half free from the receptacle, pale amber-yellow, straight and symmetrical or nearly so, the tip well distinguished, symmetrical, blackish, the lip-cells symmetrically rounded and protruding slightly on either side, their distal margins straight and horizontal, or nearly so. Receptacle concolorous with the perithecium, cell I tinged with brown, a brownish shade below the base of the perithecium, cell IV bulging distally where it is rather faintly suffused with blackish. Outer appendage simple, the basal cell more than twice as long as it is broad, the two cells above it abruptly narrower and equal; two or three of the cells above these broader with thicker walls, the rest of the appendage tapering; the whole rigid, straight, erect or bent toward the tip of the perithecium, a part of which it may overlap; inner appendage consisting of a small basal cell bearing a very short one- or two-celled branch on either side. Perithecia 95–110 × 30 μ. Total length to tip of perithecium 240–260 μ; to insertion-cell 185–200 μ; greatest width 60 μ. Appendages 260–330 μ.

On a carabid (near *Pericallus*), Hope Collection, No. 322, Bouro, East Indies (A. R. Wallace). On superior margin of prothorax.

This species bears some resemblance to *L. erecta,* from which it differs in the conformation of the bulbous tip of its perithecium, the relation of the latter to the insertion-cell and the enlargement of the receptacle below the insertion-cell, which is slightly bent (fig. 27), the outer appendage lying across or against the tip of the perithecium.

Laboulbenia platystoma Thaxter. Plate LX, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 194. Dec., 1899.

Perithecium free except at the very base, straight, rather long and narrow, pale amber-yellow becoming slightly tinged with brown, slightly and symmetrically inflated; the tip black, opaque, the lip-cells forming an abruptly spreading almost flat symmetrical termination with a slight median indentations, two of the lips forming a small median hyaline truncate cone, the other two arching over them from the outer and inner side, wholly opaque except their inner margins, the blackened part not quite meeting in the median line. Receptacle medium, pale amber-yellow becoming tinged with brown distally. Outer appendage mostly simple, the basal cell about twice as long as broad, often slightly inflated, the rest of the appendage much narrower, straight, rigid, tinged with brown, tapering somewhat distally; the inner appendage consisting of a basal cell about half as long as that of the outer, producing a branch on either side; the branch usually bearing an antheridial branchlet near its base, the branches and the outer appendage similar, often curved slightly outward, becoming tinged with brown. Perithecia 175 × 40 μ; the tip 37 μ broad. Total length to tip of perithecium 325–400 μ; to insertion-cell 185–230 μ; greatest width 55–63 μ. Appendages about 175 μ (longest).

On inferior surface of *Catascopus* sp., Paris Museum, No. 119, New Guinea.

This species, although closely allied to *L. tenuis* and *L. aristata,* is clearly distinguished from all others by the very peculiar conformation of the symmetrical spreading tip of its perithecium, the detail of which is shown in fig. 5; the black portions at the apex strongly suggesting the end of a pair of horizontal cut-plyers, or blacksmith's tongs. The material, though scanty, is in fairly good condition and shows no essential variation. The differentiation of the three basal cells of the outer appendage is similar to that of *E. Maylayensis* though less distinct and constant.

LABOULBENIA THYREOPTERI Thaxter. Plates LV and LXIV, fig. 15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 205. Dec., 1899. *L. Borneensis* Thaxter, l. c., Vol. XXXVIII, p. 28. June, 1902.

Perithecium nearly free, proportionately large, dull amber-brown, straight, narrower at the base, the inner margin slightly convex, the outer concave through the presence of a prominent subterminal hump, which is suffused with blackish brown, the suffusion often involving a fainter discoloration of the subbasal wall-cell below it; the tip small, prominent, and abruptly differentiated, blackish with broad hyaline lips. Receptacle slender, the basal cell black, opaque, mostly curved below, very slender; the subbasal cell broader, suffused with blackish, mostly verrucose or coarsely punctate, the remaining cells normal and concolorous with the perithecium. Insertion-cell thick and narrow. The outer appendage simple, its basal cell long, undifferentiated; the basal cell of the inner appendage shorter, bearing a branch distally on either side, all the branches similar, crowded, concolorous with the perithecium, erect, straight or bent slightly toward the perithecium, the inmost in contact with it. Spores 55 × 4 μ. Perithecia 140–175 × 14–25 μ. Total length to tip of perithecium 340–400 μ; to insertion-cell 250–270 μ. Appendages 120–140 μ.

On the elytra of *Thyreopterus flavosignatus* Dej., Brit. Mus. No. 561, Port Natal, Africa. On *Thyreopterus* sp., Paris Museum, No. 125, Africa and Sharp Collection, No. 1201, South Borneo.

A reexamination of these forms shows that there is no essential difference between the African and Borneo material, although the pale yellow color of the latter, Plate LV, which is formerly distinguished as *L. Borneensis,* its more prominent perithecial hunch, the absence of the blackened induration of the basal cells of its receptacle, and some other points, give it a somewhat different appearance. The species is a peculiar one, and most nearly allied to *L. ceratophora* and others of the curious group of forms which occur on this and related hosts.

LABOULBENIA FINITIMA Thaxter. Plate LX, figs. 21–23.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 176. Dec., 1899.

Perithecium one half to two thirds or more free, olivaceous brown, lighter distally, becoming wholly dark brown, straight or curved outward, rarely inward; the tip broad, rounded, generally not well differentiated, blackish. Receptacle relatively small, the basal cell hyaline or yellowish, the rest concolorous with the perithecium; cells III–V lighter, cell VI extending down almost or quite to cell I. Appendages brownish or pale olivaceous, the outer simple, its basal cell twice as long as broad, externally somewhat rounded and more deeply tinged with brown; the basal cell of the inner appendage half as large, bearing a branch on either side which is usually furcate above its basal cell: all the branches erect, closely appressed, and often bent terminally across the tip of the perithecium which they scarcely exceed. Perithecia, average 125 × 45 μ. Total length to tip of perithecium, average 240 μ; to insertion-cell 145–150 μ; greatest width 48–50 μ. Appendages 30 μ.

On *Pericallus guttatus* Chev., Paris Museum, No. 78, Brit. Mus. No. 571, Java; on *P. cæruleovirens* Tat., Brit. Mus. No. 570, Singapore. On the legs.

The type form of this species (fig. 21) strongly suggests *L. scelophila*, which occurs on the legs of *Platynus extensicollis* in New England; but the two species are abundantly distinct. The variety represented in fig. 23 occurred with the normal form on *P. cæruleovirens*, and was associated with other forms like fig. 22, in which the general habit is slightly different. The figures given are darker than they should appear, the typical form having a somewhat translucent olive tint.

LABOULBENIA MICROSOMA Thaxter. Plate LX, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 187. Dec., 1899.

Peritheeium free, several times as large as the receptacle, smoky brown darker basally and distally, the longitudinal septa subhyaline, the outer margin concave, the inner convex; a subterminal external small rounded elevation; the tip very broad, short, almost flat-topped, the outer angle almost a right angle, the inner rounded. Receptacle consisting of a basal cell which is nearly hyaline, above which cells II, III, and VI form an almost transverse row; cell II median, triangular, lying between the other two, the receptacle abruptly expanded in this region; cells III and IV small and flattened: similar in size and shape: cell V relatively large, lying within cells III and IV and extending quite to the base of the latter. Insertion-cell and basal cells of the appendages nearly opaque and indistinguishable from one another, the outer basal cell apparently producing two branches antero-posteriorly; the inner, a branch on either side, all the branches (broken) brown, stiff, erect or slightly divergent. `Perithecium 185 × 66 μ. Total length to tip of perithecium 295 μ; to insertion-cell 90 μ; greatest width 65 μ.

On *Serrimargo guttiger* Schaum., Brit. Mus. No. 560, Penang, East Indies. At base of posterior legs.

The small rounded distal portion of the receptacle in this species recalls that of *L. Formicarum*, but the cells are differently arranged. The relative size and arrangement of cells III, IV and V are quite unusual. The appendages are unfortunately badly broken, but appear to be very similar to those of *L. Serrimarginis* to which species I am inclined to believe it is most nearly allied. A single specimen only has been examined.

LABOULBENIA MACULATA Thaxter. Plate LIX, figs. 21–22.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 184. Dec., 1899.

Perithecium free, dark brown becoming nearly opaque, the outer margin more convex than the inner; somewhat constricted at the base, the tip rather abruptly distinguished externally, the margins nearly straight, the inner lips small and prominent, the outer broad, straight, oblique. Receptacle abnormal, cell I short, slender, curved, opaque; cell II nearly hyaline in the middle, brownish above, coarsely spotted with blackish brown below, becoming darker and indistinguishable from cell I at its base; cell VI distally nearly hyaline and narrow, extending down beside cell II nearly if not quite to cell I, its base spotted as in cell II; cell VII (the "secondary stalk-cell") external to it, the margin blackish brown especially distally, extending down beside cell VI to within a short distance of its base where it is similarly punctate towards its base or throughout; cell III narrow, external to the upper two thirds of cell II, punctate below, its distal end close beside the corresponding termination of cell II; the base of cell IV overlapping cell III so that a cross section in this region would cut cells II, III, IV, VI, and VII: distal portion of the receptacle concolorous with the perithecium or somewhat paler. The perithecium bent toward and partly or wholly overlapping the insertion-cell. Appendages directed across the lower half of the perithecium, sometimes at right angles; the outer simple, consisting of a long basal cell sometimes slightly inflated, the rest of the appendage brown: the inner appendage consisting of a basal cell less than half as large, which produces two branches one on either side, the basal cells of which are usually curved, somewhat inflated, bearing two branchlets distally; all the branches slender, rather rigid and straight, parallel and closely approximated, tapering slightly. Perithecia 225 × 60 μ. Total length to tip of perithecium 560 μ; to insertion-cell 375 μ; greatest width 140 μ. Appendages about 200–250 μ.

On *Serrimargo guttiger* Schaum., Brit. Mus. No. 559, Penang, East Indies; on *Serrimargo* sp., Borneo, in Cambridge University Collection (England), No. 1216.

This species is very clearly distinguished by the peculiar conformation of its black maculate receptacle, and the attenuation, induration, and opaque suffusion of the basal cell of the latter; which is similar to the condition seen in the type forms of *L. Thyreopteri.* The cell arrangement is somewhat similar to that of *L. Serrimarginis,* which is its nearest ally, but which appears to be very different in other respects. Although the cell arrangement is so abnormal, I am inclined to believe that the species is related to some of the forms like *L. finitima* and *L. subconstricta* which occur on similar hosts.

LABOULBENIA SERRIMARGINIS Thaxter. Plate LIX, figs. 23.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 201. Dec., 1899.

Perithecium about three fourths free, dull olive-brown, the outer margin nearly straight, the inner bent rather abruptly below the tip; the latter not abruptly distinguished, broad, blunt, the lips not well defined, dull blackish. Receptacle dull olive-brown, except the almost hyaline rather slender basal cell; the rest of the receptacle short and stout, concolorous with the perithecium, cell VI broad and extending down to cell I beside cell II, cell VII extending half way down cell VI externally, the septa of cells III and IV oblique; cell III extending up to the base of cell V. Outer appendage simple translucent brown, paler distally, the basal cell twice as long as broad, bulging slightly externally; inner appendage consisting of a much smaller basal cell which bears a branch on either side; the basal cells of each branchlet bearing two simple branchlets similar to the outer appendage, erect, brownish, approximated. Perithecia 136 × 50 μ. Total length to tip of perithecium about 300 μ; to insertion-cell 190 μ; greatest width 85 μ. Appendages 260 μ.

On *Serrimargo guttiger* Schaum., Brit. Mus. No. 558, Penang, East Indies. At base of anterior legs.

A form most nearly allied to *L. maculata,* the cells of the receptacle being somewhat similarly arranged and the appendages similar in general, but hardly to be confused with this species. Two mature specimens only have been examined.

LABOULBENIA PERICALLI Thaxter. Plate LV, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 194. Dec., 1899.

Perithecium becoming almost opaque, its upper fourth, sometimes only the tip, free from the receptacle, relatively small, the tip more or less prominent, sometimes subconical, short, and wholly black (often more prominent, abruptly distinguished, the rounded lips well defined with hyaline edges). Receptacle normal, cells III and IV large and broad, concolorous with the perithecium; cells I and II together with the lower end of cell VI pale yellowish. Outer appendage mostly simple, stout, the lower cells slightly inflated; inner appendage consisting of a much smaller basal cell, bearing a usually simple branch on either side very similar to the outer appendage; all the branches yellowish or becoming tinged with brown, especially toward the base. Perithecia 110–130 × 37–45 μ. Total length to tip of perithecium 200–300 μ; greatest breadth about 75 μ.

On *Pericallus guttatus* Chev., Paris Museum, No. 78, Java; on *Miscelus* sp., Paris Museum, Nos. 113, 114, 115, New Guinea.

The type form of this species (Paris No. 78), which is represented in fig. 12, is sufficiently characteristic, its general habit recalling that of *L. Maylayensis,* the perithecium being almost wholly united to the receptacle. I have seen specimens, however, that vary toward *L. Catascopi,* and it may be necessary to unite the two eventually.

LABOULBENIA CATASCOPI Thaxter.

The typical form of this species as it occurs in Mexico, is sufficiently well distinguished, and easily recognizable by its uniform amber-brown color, the inflated basal cell of the outer appendage, and the rather abruptly distinguished tip of its perithecium. A comparison, however, of material on *Catascopus* of various species and from widely different localities, as well as of forms of the same general type which occur on allied hosts, renders any definite decision as to the limits of this species a matter of great difficulty. The East Indian forms approach very closely indeed to *L. flagellata*, though they retain the coloration of the type, and the slightly individual perithecial tip. The basal cell of the outer appendage is either not at all or very inconspicuously inflated, and one form from the Philippines can hardly be distinguished from typical *L. flagellata.* On other American hosts, however, the inflation of the basal cell becomes even more pronounced than it is in the type, the coloration changes, and on species of *Ina, Pinacodera, Cymindis, Euproctus, Apenes* and *Callida* a form occurs which, without comparison, I should not have hesitated to separate specifically. Such a separation may eventually prove desirable, yet I have thought it best to group all these forms under the present name until they can be more carefully revised and illustrated. The material thus grouped has been obtained from the following hosts. British Museum; No. 564 on *Catascopus fascialis* Willd., Panama No. 565 on *C. amomus* Chaud. New Guinea; No. 567 on *Catascopus* sp. Mexico; No. 555 on *Apenes pallidipes* Chd. Costa Rica; No. 734 on *Callida quadrispora* Bates, Volcan de Chiriqui, Panama; No. 739 on *Pinacodera atrata* Chev., Puebla, Mexico; No. 716 on *Ina costulata* Chd., Zapota, Guatemala; No. 552 on *Cymindis pallipes* Reich., Venezuela; No. 363 on *Coptodera arcuata* Chev., Bobo, Mexico; No. 566 on *Catascopus* sp., Philippines. Hope Collection; No. 298 on *Catascopus elegans* Fabr., Amboyna, E. Indies; No. 297 on *C. cupripennis* Thoms., Borneo; Nos. 271 and 272 on *Callida "cancellata,"* Brazil; No. 303 on *Physodera* sp., no locality (typical). Paris Museum; No. 88 on *Catascopus* sp., Java; No. 116 do., New Guinea; No. 119 do., New Guinea. Sharp Collection; No. 1210 on *Colpodes auratus* (= ? *atratus* Chd.,) Pantaleon, Mexico. Berlin Museum; on *Catascopus fascialis* Wied., Bengal.

LABOULBENIA HAWAIIENSIS Thaxter. Plate LVII, figs. 1–3.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 40. June, 1902.

Perithecium variously suffused with dark olive brown, sometimes transparent brownish yellow, becoming nearly opaque, about one quarter, or only the tip, free from the receptacle, rather short and stout; the tip black, often bent outward, tapering rather abruptly; the lip-edges hyaline, rather prominent and outwardly oblique. Receptacle pale reddish amber or yellowish, becoming variously suffused with dark olive-brown, especially distally; the basal cell more commonly narrow and hyaline below; abruptly broader and suffused with dark olive-brown below the base of cell II, which is often abruptly broader through a slight inflation in this region, and similarly suffused, the suffusions often faint; cells III to V often deeply suffused with olive-brown, faintly striate; cells III and IV subequal; cell V extending more or less prominently upward along the inner margin of the perithecium which is further bordered by cells III and IV; the insertion-cell carried obliquely outward by these modifications. Basal cell of the outer appendage usually hyaline, bearing normally two branches; the basal cell of the inner hyaline, that of the outer often small and blackened, bearing two branchlets; the outer shorter, more slender, opaque (usually broken); the basal cell of the inner appendage similar to that of the outer, often protruding somewhat inward, bearing two branches like the outer, or less often laterally, that next the perithecium bearing one or more antheridial branchlets; the antheridia terminal in groups of two or more, sometimes densely clustered; the other bearing similar antheridial branchlets or more often one or more long sterile branchlets like the outer appendage; all the sterile branches usually elongated in a sweeping curve toward the perithecium, commonly rich brown or nearly opaque, sometimes hyaline, sometimes multiplied by branching close to the base. Spores 65 × 5 μ. Perithecia 90–125 × 40–55 μ. Receptacle 200–335 μ. Appendages 290–725 μ. Total length to tip of perithecium 230–360 μ.

On *Atelothrus erro* Blk. Maui, No. 1230 (Type); *A. gracilis* Sharp, Lanai, No. 1232; *Mauna frigida* Blk., Maui, No. 1221; *Colpodiscus lucipetens* Blk., Maui, No. 1217 *Colpocaccus tantalus* Blk., No. 1223; *Colpocaccus Hawaiiensis* Sharp, Hawaii, No. 1224; *C. Lanaiensis* Sharp, Lanai, No. 1225; *C. posticatus* Sharp, Kaui, No. 1227; *Mesothriscus muscicola* Blk., Hawaii, No. 1237; *M. tricolor* Sharp, Molokai. No. 1239; *M. alternans* Sharp, Kaui, Nos. 1220 and 1243; *Mecyclothorax pusillus* Sharp, Maui, No. 1263; *M. ovipennis* Sharp, Maui, No. 1266, and Molokai No. 1267; *M. montivagus* Blkm., Maui, No. 1269; *Mecyclothorax* sp. ? Maui, No. 1270; on "*Bembidium*" Nos. 1275–1276, and 1280, Kaui. On the following numbers in the Perkins Collection: Kaui, Nos. 1248, 1249, 1251, 1257; Maui, Nos. 1214, 1226, 1264, 1271; Molokai, Nos. 1250, 1272, 1274; Hawaii, Nos. 1265, 1268.

Reference has previously been made under the genus *Laboulbenia* and elsewhere to the group of variable forms which occur on the carabid fauna of the Hawaiian Islands. Of these the one which comes nearest to the ordinary "*flagellata*" type is the present species, which, although it is very closely allied to *L. Disenochi*, appears to differ normally in the development of the distal portion of the receptacle less than a third of which, or sometimes only the tip, is free. Its coloration is very variable; the distal portions, including the perithecium, being most commonly very deeply suffused with contrasting rich black-brown, as in figs. 1 and 2, while less frequently the receptacle and all but the tip of the perithecium may be yellowish or reddish amber, with inconspicuous suffusions. The size is usually moderate, and not subject to extreme variations depending on position of growth; but one form represented in Fig. 3, which appears to belong here and occurs on *Mecyclothorax pusillus* Sharp, has a short stout rotund habit which is peculiar, the specimen figured measuring about 160 × 70 μ. Of the illustrations in the accompanying plate, fig. 1 is taken from material on *Colpodiscus tantalus* from Oahu; fig. 2 from *Metromenus ero*, the Type, in which an outer branchlet is broken off, and fig. 3 as above mentioned.

Laboulbenia Disenochi Thaxter. Plate LVII, figs. 4 and 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 34. June, 1902.

Perithecium three quarters or wholly free, transparent, yellowish, becoming more or less irregularly and for the most part rather faintly suffused with blackish brown; the tip relatively large, black, more or less well distinguished, the black suffusion not abruptly limited and extending some distance downward externally; the lips outwardly oblique, hyaline about the pore. Receptacle rather short and stout, normal, pale yellowish, often becoming tinged with brown distally where it is rather faintly striate. Insertion-cell well defined, slightly oblique. Outer appendage consisting of an erect series of usually four hyaline cells, each of which bears *externally* (the upper terminally) a stiff simple branch of variable length, curved outward and upward, deeply blackened externally, the notched often broadly hyaline upper (inner) margin contrasting: the basal cell of the inner appendage bearing a branch on either side, mostly two- to three-celled, and resembling the outer appendage, except for the presence of basal antheridial branchlets on which the brown antheridia are borne terminally, usually in pairs. Spores 65 × 6 μ. Perithecia 150–165 × 58–62 μ, sometimes smaller. Receptacle 185–220 μ. Total length 290–360 μ.

On *Disenochus fractus* Sharp, Kaui, No. 1222; *D. agonoides* Sharp, Halcakala, Hawaii, No. 1229; *D. aterrimus* Sharp, Kaui, No. 1218; *D. sulcipennis* Sharp, Kaui, No. 1219; *Brosconegneus optatus* Sharp, Oahu, No. 1215.

This species, which is closely allied to *L. Hawaiiensis*, appears to differ normally in the character of the receptacle, the distal portion of which is less well developed, more compact, and wholly, or for the most part, free from the perithecium, fig. 4 representing the only exception seen in a large series. The main axis of the outer appendage, and the primary branches of the inner, are better developed; sometimes consisting of five or six superposed hyaline cells from which the usually jet black, stiff, variously elongated and curved simple branchlets arise externally. The Type on *Disenochus sulcipennis* is represented in fig. 7, and illustrates almost the extreme development of these branchlets, as well as the condition in which the perithecium is wholly free from the receptacle. Fig. 6 represents a form on *D. agonoides* the two figures illustrating almost the extremes of variation. It is a question, however, whether this and the preceding were not better united under one protean species.

Laboulbenia sphyriopsis Thaxter. Plate LVII, fig. 5.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 53. June, 1902.

Perithecium free, projecting at right angles to the axis of the receptacle or recurved, opaque, blackish brown, slightly asymmetrically inflated below, the tip not distinguished, very broad, truncate or bluntly rounded, concolorous. Receptacle relatively slender, hyaline, cells I and II relatively very large, the rest small; cell I shorter, often tinged with brown; cells II and III edged with blackish brown externally; cell IV wholly blackish brown; cell V hyaline or partly suffused, the insertion-cell thick. Basal cell of the outer appendage more or less suffused, giving rise to an outer and an inner branch; the basal cell of the former giving rise to an outer, shorter, and an inner branchlet; the inner branch simple: basal cell of the inner appendage bearing a simple branch, distally furcate above its basal cell; the branchlets both fertile, short, with a single terminal antheridium; or one of them sterile and similar to the outer appendage, short, stout, nearly straight, stiff, opaque, hyaline-tipped: the antheridia relatively large, solitary; the broad neck bent abruptly at right angles. Perithecia 90–110 × 40–48 μ. Receptacle 220–250 μ. Appendages 150–185 μ.

On *Metromenus caliginosus* Blk., Oahu, Honolulu, *M. epicurus* Blkm. No. 1261, and No. 1262. No. 1256 on *M. latifrons* sp. Molokai Mts., Maui. Perkins Collection, Hawaiian Carabidæ. Right inferior surface of prothorax.

This species, which is allied to both *L. Hawaiiensis* and *L. Disenochi*, is well distinguished by its peculiar hammer-like habit, and absolutely opaque blunt perithecium. The slender, nearly isodiametric perithecium is at first quite hyaline, but may become slightly soiled with yellowish brown, as well as deeply suffused externally below the insertion cell. The type form on *M. caliginosus* was obtained from several individual hosts always in the same position and does not vary. The form on *M. epicurus* and *M. latifrons* is slightly different, in that the perithecium does not project at right angles from the receptacle, is somewhat narrowed toward the tip, while the stiff black branchlets of the appendages are distally enlarged, having a club-shaped habit.

Laboulbenia cauliculata Thaxter. Plate LVII, figs. 8–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 29. June, 1902.

Perithecium short and stout, straight or slightly curved, inflated more prominently on its inner side; dull olivaceous brown, translucent, or becoming opaque; the basal wall-cells forming a well-defined pale olivaceous or hyaline narrow stalk; the tip black, broad, not distinguished, except by its color; the rather coarse, but not prominent, lip-edges hyaline and outwardly oblique. Receptacle relatively short and small, the basal cell usually curved, narrow and subhyaline below, becoming opaque and punctate distally; the subbasal cell having only a small portion of its posterior margin free, cell III being subtriangular and overlapping it; cell IV nearly as broad as, and somewhat larger than cell III, separated from cell V, which may equal it in size, by a vertical or but slightly oblique septum; cells II–VI mostly translucent yellowish brown, often becoming opaque. Insertion-cell rather broad: basal cells of the appendages hardly distinguishable, the outer giving rise abruptly to usually two erect, or slightly divergent, stiff, bristle-like, curved branches, which are blackish brown, externally opaque, producing short hyaline branchlets along their hyaline inner margins: the basal cell of the inner appendage producing a branch on either side consisting of from one to two cells from which arise several branchlets similar to those of the outer appendages. Spores 58 × 5 μ. Perithecia 125–165 × 45–60 μ, including stalk (18–22 μ). Receptacle 90–100 × 35–40 μ. Appendages 125–185 μ. Total length to tip of perithecium 220–290 μ.

On *Colpocaccus Lanaiensis* Sharp, No. 1226; *C. marginatus* Sharp, Kaui, No. 1228; on *Atelothrus depressus* Sharp, Lanai, No. 1231; *A. constrictus* Sharp, Molokai, No. 1234; *Mesothriscus Hawaiiensis* Sharp, Hawaii, No. 1238; *M. alternans* Sharp, No. 1220, Kaui, No. 1242, Maui, 1241 and 1244 Oahu; *M. muscicola* Blkm., No. 1236, Tahura; *Metromenus fraudator* Sharp, Nos. 1253, 1255, Maui; on other numbers of the Perkins Collection of Hawaiian Carabidæ as follows: Kaui, Nos. 1246–1248; Molokai, No. 1250; Maui. Nos. 1214, 1253, 1255,

Var. PROLIXA Thaxter. Plate LVII, fig. 11.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 29. June, 1902.

Perithecium straight or slightly curved, large and greatly elongated, the body opaque; the neck usually elongate, hyaline or translucent. Receptacle as in the type, but usually translucent brownish yellow. Branches of the appendages usually more numerous and more slender, the two main branches of the inner often consisting of from three to four cells. Spores 70 × 5 μ. Perithecia 365–540 × 55 μ, including the stalk (90–220 × 36 μ). Appendages 220 μ. Total length to tip of perithecium 450–670 μ.

On *Mesothriscus tricolor* Sharp, Molokai, No. 1239; *M. collaris* Sharp, No. 1240, Molokai; *Metromenus æqualis* Sharp, No. 1260, Oahu; and on No. 1235, Maui, in Perkins Collection.

Var. SPECTABILIS Thaxter. Plate LVII, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 30. June, 1902.

Perithecium large, long, tapering more or less symmetrically above and below, strongly curved (or often recurved) outward throughout its length, including the clearly distinguished hyaline neck; dark olive brown, becoming nearly opaque, the black tip slightly distinguished, the lip-edges hyaline. Receptacle as in the type. Appendages as in the type, but one or both of the primary branches of the inner appendage hyaline, contrasting, many celled, and variably elongated through continued terminal proliferation, black branchlets arising one from each successive cell and alternating on opposite sides of the primary branch, often very long, curved upward and inward so as to cross one another, when two primary branches are present, with such regularity as often to form a lattice-work pattern; the series often complicated by the production of copious slender hyaline branchlets from the upper side of the secondary branches. Perithecia, main body, 165–200 × 40–48. Total length of appendages 290–360 μ.

On Hawaiian Carabidæ from Perkins Collection: No. 1261, on *Metromenus caliginosus* Blk., Honolulu, Oahu; No. 1179 and No. 1259 (Type); on *M. mutabilis* Blk., Oahu; Nos. 1254 and 1256, on *M. latifrons* Sharp, Molokai.

It has been with some hesitation that I have separated the three forms included under this species as varieties, yet repeated recomparison of my material has only served to convince me that, although three species are probably in process of differentiation here, it is better to consider them varieties. *L. cauliculata* (typica) might well be separated from *L. spectabilis*, yet between them lie various modifications of *L. prolixa* which cannot be separated on the one hand from the type, and on the other from *L. spectabilis*. The latter, which is one of the most beautiful and striking forms in the whole group of Laboulbeniales is characterized by the form and curvature of the perithecium and of its slender more abruptly distinguished neck, as well as by the more luxuriant, though variable, development of the branches of its inner appendages. An extreme illustration of this is represented in fig. 12; but in no respect does this branching differ, except in its luxuriance from that of *L. prolixa*. The latter form on the other hand, although distinguished in general by its larger size, and large elongate perithecium and neck, varies to less striking forms which cannot, I think, be distinguished from the usually smaller type-form of *L. cauliculata*. Although the habit of the receptacle differs in all three varieties, the appendages do not differ greatly from well developed specimens of *L. Disenochi*, the main axis of the outer appendage, and of the primary branches of the inner, differing from the fact that in the present species the branchlets alternate on opposite sides of the main axis, and that these branchlets, in *L. prolixa* and *L. spectabilis* especially, give rise to often very long slender and copiously developed unilateral hyaline branchlets.

Of the accompanying figures fig. 8 represents a type from *Colpocaccus Lanaiensis* var.; fig. 9 from host *indet.* No. 1246; fig. 10 from *Metromenus fraudator*: fig. 11 (*L. prolixa*), Type, on *Mesothriscus tricolor* Shp.: fig. 12 (*L. spectabilis*) Type on *Metromenus mutabilis* Shp.

LABOULBENIA MEXICANA Thaxter.

Although the appendages of this as well as of the succeeding species bear no very close resemblance to the type which I have distinguished as the "*Galerita* type," it seems more than probable that they represent the original *flagellata*-like condition from which this series has been derived; since the species is the most universally distributed form that occurs on *Galerita* in the western hemisphere. The antheridia, instead of arising terminally from special branches, occur one to three together below the septa of branchlets borne on the branches of the inner appendage. The typical form of this species, which occurs only in Mexico and Central America, is stout and large, sometimes more than a millimeter in length, usually amber-brown throughout; although in a few instances the perithecium becomes smoky brown, a condition well marked in material from Columbia and Costa Rica (Berlin Museum No. 967 and British Museum No. 521). These forms, as is pointed out below, approach perhaps too closely to *L. melanotheca*, which is otherwise very clearly distinguished, even when it occurs in company with the present species on the same host. South of the Isthmus of Panama, however, material from Venezuela, Peru, Brazil and the Argentine, shows a distinct variation from the type; the individuals approaching the "*flagellata*" type more closely; usually smaller, sometimes not over 300 μ in length, pale straw-colored, with a contrasting black perithecial tip, and more or less strongly marked olive-brown suffusions; never, as far as I have seen, assuming the typical amber-brown tint. The appendages of these more southern types are also usually more slender and tapering, and sometimes exceed the receptacle in length. The specimens from Peru with their dark perithecia and numerous divergent branches are especially characteristic.

Specimens of this form have been examined as follows. British Museum: No. 521 on *Galerita Lecontei* Dej., Costa Rica; No. 520 on *Galerita* sp., Mexico; No. 709 on *G. Americana* Linn., Volcan de Chiriqui, Panama; No. 514 on *G. pallidicornis* Reich., Columbia: No. 708 on *G. æquinoctialis* Chd., Ventanas, Mexico; No. 517 on *G. unicolor* Dej., Brazil and Forest of Santarem, Amazon, No. 518. Hope Collection, No. 246, on *G. ruficollis* Latr., No. 255 on *Galerita* sp., Venezuela; No. 257 on *G. ruficollis* Dej., Cuba. Paris Museum No. 136 on *Galerita* sp., South America and Nos. 73–74, Venezuela; No. 160, Rosario, Argentina. U. S. National Museum, on *Galerita* spp., Brazil and Peru. Berlin Museum No. 962 on *Galerita* sp., Bahia, Brazil; No. 963 on *G. striata* Klg., Port au Prince; No. 964 on *Galerita* sp., Columbia; No. 965 on *Galerita* sp., Guayaquil, Ecuador; No. 960 on *G. carbonaria* Mannerh., Brazil; No. 968 on *G. pallidicornis* Reich., Columbia. Occurring on various parts of the host but most commonly on the elytra.

LABOULBENIA MELANOTHECA Thaxter.

It is not altogether certain that this form might not better be designated as a var. *melanotheca* of *L. Mexicana;* since certain specimens on *Galerita pallidicornis* (?) from Columbia (Berlin Museum, No. 967) and on *G. Lecontei* from Costa Rica (British Museum, No. 521) both of which were found growing at the bases of the anterior legs, seem to represent a transitional condition, and have been referred to *L. Mexicana* rather than to the present form. Nevertheless the typical *L. Mexicana* when it occurs, as it sometimes does abundantly, in company with *L. melanotheca* on the same host, shows no tendency to intergrade, and the two may be distinguished at once with a hand lens. Typical *L. melanotheca* has been obtained as follows: British Museum, No. 521 on *Galerita Lecontei* Dej., Costa Rica; No. 710 on *G. ruficollis* Latr., Nicaragua; these specimens being exactly like the type in the form and coloration of their perithecia, which project at an angle to the axis of the receptacle and are furnished with slender hyaline necks, the wall-cells showing a slight spiral twist. It is uncertain whether *G. ruficollis* here referred to, is the same with *G. erythrodera* Brullé of which *G. ruficollis* Dej. is a synonym, or whether it is *G. ruficollis* Latr. which appears to be a different form.

LABOULBENIA ANGULARIS Thaxter. Plate LXIII, fig. 16–17.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 157. Dec., 1899.

Perithecium wholly free, symmetrically inflated, straight, evenly suffused with smoky brown except the very short narrow hyaline neck-like base; the tip well differentiated, black, distally hyaline, the whole perithecium inserted nearly at right angles to the axis of the receptacle. Receptacle amber-yellow or amber-brown, the basal cell tinged with smoky brown, cell II abruptly broader and long, all the cells except cell I more or less conspicuously marked by short transverse striæ, cell V bulging on the inner side and carrying the black insertion-cell out free from the neck of the perithecium. Outer appendage consisting of an erect series of about six obliquely superposed cells, the lower becoming nearly opaque, the basal one larger and darker, opaque externally and below; each cell bearing externally a single simple branch, the branches consisting of a basal portion of mostly three short cells prominently constricted at the blackish septa, and a terminal portion (unicellular (?), brownish): the inner appendage consisting of a basal cell which gives rise to a series of superposed cells on either side, like that of the outer appendage and similarly branched, one of the series in the types much shorter than the other (two and four celled): the branches all erect, closely apposed, more or less suffused with brownish. Perithecia 280 × 45–55 μ. Total length to tip of perithecium 680 μ; to insertion-cell 420 μ; greatest width 75 μ. Appendages (broken) 55 μ.

On *Galerita unicolor* Dej., Brit. Mus. No. 516, Amazon River. Inferior surface of prothorax.

Two specimens only of this well marked species one of which is badly broken, have been examined. It bears some resemblance to *L. melanotheca* in general appearance; but the appendages at once distinguish it, not to mention other points of difference. The antheridia are broken in both specimens but appear to have been solitary. The perithecial tip, represented in fig. 17, is drawn from the second broken specimen, and appears to represent a view at right angles to that shown in fig. 16. It is possible, however, that this may have been somewhat abnormally developed, as the specimen is evidently old.

Laboulbenia speciosa Thaxter. Plate LXII, fig. 5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 201. Dec., 1899.

Perithecium free, long and narrow, somewhat swollen at the base, the inner half or less hyaline, the outer dark clear blackish brown; the basal wall-cells forming a short hyaline stalk narrower than the ascigerous portion; the tip hardly distinguished, bluntly rounded, slightly oblique outwardly, black, hyaline about the pore. Receptacle very elongate, hyaline except cells IV and V which are tinged with amber-yellow, indistinctly punctate with short transverse striæ except cell I; cell II very elongate. Insertion-cell black, free from the stalk of the perithecium through the slight enlargement of cell V. Outer appendage consisting of a series of five to eight cells superposed not very obliquely, the basal one larger tinged with brown below, the rest hyaline; all the cells producing externally a single simple branch, the lower three, sometimes two, cells of which are mostly not longer than broad, constricted at the black septa, distally faintly brownish yellow; the inner appendage consisting of a basal cell which bears on either side a branch consisting of a series of about four cells, like that of the outer appendage, and bearing similar branches in a similar fashion; the three series quite distinct from one another. Perithecium, including its short neck, about 285 × 56 μ. Total length to tip of perithecium 750–925 μ; to insertion-cell 450–650 μ. Appendages about 200–280 μ.

On *Galerita unicolor* Dej., Brit. Mus. No. 517, Brazil. On inferior surface of the prothorax. On *Galerita* sp. indet., Bahia, Brazil, at base of mid legs: Berlin Museum No. 962.

Four specimens of this very distinct and beautiful species have been examined, none of which show any perceptible variation from the type. The antheridia in all are either broken, or so disorganized that it is not possible to describe them in detail. They appear, however, to have been solitary, colorless, and unusually long. Although the bases of the branches of the appendages are usually three-celled (the cells distinguished by blackened septa) the upper ones occasionally include but two. The species is perhaps as nearly allied to *L. angularis* as to any of the other species, but its black and white perithecium is in itself sufficient to distinguish this apparently rare form from other known species.

Laboulbenia corniculata Thaxter. Plate LXII, fig. 17.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 31. June, 1902.

Hyaline becoming pale yellowish. Perithecium becoming tinged with brown, usually bent inward from the base at an angle to the axis of the perithecium, sometimes at right angles (the appendages and their insertion undergoing a corresponding change in position), relatively stout and short, somewhat irregular in form, distally slightly inflated, with a more or less well-marked external elevation just above the base; the tip rather abruptly distinguished, relatively narrow, the apex broadly hyaline, with coarse irregularly prominent lips, the lower half black, subtended externally by a well-developed, horn-like, blunt-tipped, hyaline outgrowth, which is larger than the whole tip and slightly curved outward. Receptacle colorless or pale yellowish, the basal and subbasal cells of about the same diameter throughout, subequal, rather long and stout in contrast to the small, compact distal portion; cells III and IV subequal, or cell IV larger, the septum between them nearly horizontal, *i. e.* cell III is not extended upward externally beside cell IV; cell V triangular, relatively small and, like cell IV, slightly suffused above with brownish yellow, below the very broad, thin, clearly defined, black insertion-cell, the upper hyaline angle of which protrudes between the basal cells of the appendages. Appendages similar in type to those of *L. Galeritæ*, hyaline, the outer consisting of about five to seven very obliquely superposed cells, which bear the simple branches externally; the basal part of each branch consisting usually of two to three short brownish inflated or squarish cells, distinguished by constrictions and dark septa, the distal part about equal to the basal in length, or somewhat longer, often unicellular, hyaline, stained reddish in the types, very thick-walled, slightly inflated at the base; the tip bent slightly, tapering or even slightly inflated. The inner appendages similar to the outer, the basal part of the branches usually three-celled, the lowest, and sometimes that next above it, consisting of a single cell which bears terminally a single relatively large antheridium, the long stout neck of which is rather abruptly bent near the middle. Spores 90–110 × 7 μ. Perithecia 175–240 × 60–80 μ. The horn-like projection about 40 × 22 μ. Receptacle 325–475 μ. Greatest total length of appendages 450–600 μ.

On inferior surface of *Galerita carbonaria* Mannerh., Brazil; Berlin Museum, No. 960.

This is one of the finest and most characteristic species of the genus, and is the only one of this section in which the perithecium is provided with a tooth-like outgrowth. The basal half of the simple branches of the inner appendages appears always to be composed of three cells, distinguished by black septa; but the lowest branch of the outer appendage has but two such cells. The solitary antheridia are unusually large, with stout necks abruptly and characteristically bent. The reddish color by which the distal portion of the branches is suffused may be accidental, but is present in all the specimens examined, both young and mature. It is perhaps more nearly allied to *L. speciosa* than to any other species and was found associated with several other wholly unrelated forms.

LABOULBENIA TRICHOGNATHI Thaxter. Plate LXII, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 206. Dec., 1899.

Perithecium free, generally straight, long, narrow and of nearly equal diameter throughout, to the base of the rather abruptly differentiated tip (sometimes, however, shorter, stout and slightly inflated), pale yellowish or becoming rather deep, evenly translucent smoky brown; the basal wall-cells forming a very short scarcely noticeable stalk; the tip obliquely black below the rather coarse and prominent hyaline lips. Receptacle generally very long and slender, pale yellowish, the basal cell tinged with blackish brown; cells IV and V amber or often becoming wholly amber-brown or smoky brown; cells IV and V large, prominently marked, especially when suffused, by short transverse lines or patches which are less numerous and distinct on the other cells. Insertion-cell well differentiated, black, carried out free from the perithecium by the enlargement of cell V. Outer appendage consisting of a series of obliquely superposed cells three to ten in number, the basal one subtriangular and blackish, the rest hyaline or yellowish, each producing distally and externally a single simple straight branch, slightly constricted at the three to four lower black septa; the distal portion without black septa, sometimes short, sometimes elongate and tapering. The inner appendage consists of a basal cell usually giving rise on either side to a single series of superposed cells, which may be further multiplied through the formation by proliferation of secondary series of superposed cells, similar to those of the outer appendage. Perithecia 165 × 55–350 ×

90 μ, average 275 × 60 μ. Receptacle very variable. Total length to tip of perithecium 425–1480 μ; to insertion-cell 275–1260 μ. Appendages, longest 600 μ, average about 400 μ.

On *Trichognathus marginipennis* Latr., Hope Collection, No. 267, Columbia, Brit. Mus. No. 525, "Tamaz," S. America; on "*T. marginata* Latr." Brit. Mus. No. 526, Brazil: Hope Collection, No. 266, "S. America"; on *Trichognathus* sp. indet.: Paris Museum, Nos. 70, 71, and 135, Venezuela and "S. America." Berlin Mus. No. 955 on *T. immarginatus*, Columbia; No. 957 on *T. cinctus* Chaud., Caracas, Venezuela. On all parts of host.

This species appears to be a decidedly variable one, not only in size and coloration, but in the development of its appendages. It is the only species of the section in which the cells of the inner primary appendages may show a secondary proliferation which results in more than the normal single series of appendiculate cells. This proliferation gives rise to variably developed secondary series of appendiculate cells, each of which bears its branch; so that where this phenomenon is pronounced, the inner appendages, as a whole, give rise to a dense tuft of very numerous branches; especially noticeable in the material on the Paris specimen, No 135, from Venezuela. Although the ordinary form, in which the inner appendages consist, as usual, each of a single series of obliquely superposed appendiculate cells, this simpler form may be associated on the same host with others in which a greater or less degree of complication has resulted through the proliferation above referred to. In the simpler type, the branches tend to be more or less constant, with two basal cells usually little, or not at all, inflated, and distinguished by blackened septa; but in the proliferous conditions, especially, this distinction is more or less lost; the number of blackened septa varying very considerably, as is indicated in fig. 2. The antheridia are normally paired, dark, and borne on a rather long single stalk-cell. Small specimens of this species are not unlike certain individuals of *L. Helluomorphæ*, or even of *L. triordinata*; the essential differences of which are pointed out under these species. It is apparently not uncommon on its host, which is a carabid allied to *Galerita* and *Brachinus*.

LABOULBENIA ADUNCA Thaxter. Plate LXII, figs. 7–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 154. Dec., 1899.

Perithecium long and slender, straight or nearly so, the outer half clear dark translucent brown, the inner pale olivaceous, wholly free, a short well distinguished hyaline neck formed by the basal wall-cells; the tip well distinguished, wholly blackish below or especially on the inner side, the inner lips black-margined, curved outward completely over the outer lips in a characteristic hook-like fashion. Receptacle uniform dirty olivaceous, cell I paler, the cells above it faintly punctate. Insertion-cell black, broad, indistinguishable from the blackened basal portions of the basal cells of the appendages. Outer appendage consisting of a very large externally rounded basal cell, becoming wholly blackened, except its upper margin, and surmounted by a series of usually six superposed hyaline cells which is curved toward the perithecium, each cell producing externally a single simple branch consisting of a basal portion made up of two roundish short cells constricted at the dark septa, and a distal portion six or more times as long, tapering, hyaline or tinged with brownish; the inner appendages consisting of basal cells wholly or almost wholly black, giving rise on either side to a short series of cells, usually three or four, similar to that of the outer appendage and similarly branched. Perithecia 225–245 × 40 μ (including neck, which is about 18 μ long). Total length to tip of perithecium, average 450 μ; to insertion-cell 200 μ, greatest width 50 μ. Appendages 150 μ.

On *Galerita unicolor* Dej., Brit. Mus. No. 516, Amazon River. Inferior surface of prothorax.

This species is distinguished from *L. geniculata*, to which it appears to be most nearly allied, by the peculiar conformation of the tip of its perithecium, as well as by the color of the latter, which is evenly suffused in the last mentioned species. The externally rounded basal cell of the outer appendage and the general suffusion and punctation of all the cells of the straight receptacle, above cell I, serve further to distinguish it.

Laboulbenia geniculata Thaxter. Plate LXIV, figs. 2–3.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 178. Dec., 1899.

Perithecium free, long and narrow, evenly tinged with translucent olive-brown except the short somewhat constricted hyaline neck, the tip well distinguished, blackish brown, bent outward, the lips coarse subhyaline oblique outward. Receptacle nearly hyaline, except cell II, and sometimes the upper part of cell I which is suffused with dirty olive-brown and faintly punctate with fine transverse striæ, long and slender, geniculate above cell II. Insertion-cell broad, black, close to base of perithecial neck. Outer appendage consisting of a larger basal subtriangular cell becoming more or less suffused with olive-brown, its outer edge straight, surmounted by a series of five or six obliquely superposed hyaline cells which curves inward toward the perithecium; each cell of the series bearing externally a simple branch consisting of two short faintly brownish basal cells constricted at the blackish septa, and a terminal hyaline tapering portion about twice as long: the inner appendage consisting of a basal cell blackened below, from which arises on either side a series of superposed cells like that of the outer appendage and similarly branched, except that one or two of the lower cells of the series bear antheridia, solitary, on a unicellular stalk. Perithecia 200–285 × 37 μ (the neck, 18–20 μ, included). Total length to tip of perithecium 500–670 μ; to insertion-cell 275–370 μ; greatest width 55 μ. Spores 65–70 × 5 μ. Appendages 150–175 μ.

On *Galerita* sp., Paris Museum, No. 160, Rosario, Argentine Republic. On left side of inferior prothorax.

The material of this form is not abundant, but all the specimens examined have the same geniculate habit and show no variations. The species possesses no very striking individual characters except its geniculate habit, which may prove inconstant; yet it does not seem possible to refer it to any of the other described species. It is most closely allied to *L. adunca*, the distinguishing points of difference in which have already been referred to under that species.

Laboulbenia incerta Thaxter. Plate LXIV, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 43. June, 1902.

Perithecium erect or slightly divergent, evenly suffused with rather pale or rarely darker translucent dirty brown, considerably, often almost symmetrically, inflated, slightly broader below; the basal wall-cells forming a short, often almost obsolete, hyaline stalk; the tip rather abruptly distinguished, usually bent slightly outward, short, stout, wholly suffused with brown, darker below; the apex evenly rounded as a rule; the outer lip-cells curved outward to the external pore, slightly prominent. Receptacle normal, hyaline, or faintly yellowish; the distal portion short and broad; the basal cell relatively short; cells III and IV subequal. The insertion-cell slightly oblique, black, contrasting, the opacity usually involving a part or the whole of the basal cells of the outer and inner appendages. Appendages similar to those of *L. perplexa*, more compact, with shorter branches; outer appendage consisting of about six to eight obliquely superposed cells, the branches divergent, curved upward; the two cells of the basal part stout, clear brown, constricted at the dark septa, roundish to long-oblong; the distal part rather stout, unicellular, tapering to a blunt apex and seldom reaching beyond the tip of the perithecium; the two branches of the inner appendage similar to the outer, except that the two lowest branches consist of a single cell, its basal septum alone dark and constricted, bearing distally a single rather short, slightly curved brown antheridium. Spores 95–100 × 8 μ. Perithecia 185–250 × 60 μ. Receptacle 185–290 × 70–80 μ. Appendage 200–250 μ. Total length to tip of perithecium 360–500 μ.

On the superior and inferior surface of *Galerita carbonaria* Mannerh., Brazil; Berlin Museum, No. 960.

This species appears to be allied to *L. perplexa*, with which it was associated on the same host in company with *L. bicolor*, *L. corniculata* and *L. fusiformis*. It differs, however, in its short, nearly evenly inflated, evenly semitransparent olive-brown perithecium; which is characterized by a stouter, somewhat differently formed, coarse-lipped tip. The receptacle also differs from that of *L. perplexa* in being nearly hyaline, or yellowish; while cells III and IV are separated by a horizontal septum, not obliquely superposed, as in the last mentioned form. The primary appendages are not divergent, as in *L. perplexa*, their branches much shorter, the basal cells of the primary appendages combining with the insertion cell to form a much broader black, and externally more prominent, general insertion. The perithecium of the present species is, in all the examples, marked by fine longitudinal wrinkles which may be due to a lack of complete turgescence in the mounted material.

LABOULBENIA TRIORDINATA Thaxter. Plate LXIII, fig. 15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 207. Dec., 1899.

Perithecium usually wholly free from the receptacle, very variable, amber-brown or usually becoming almost black, paler subdistally, generally somewhat elongate, the wall-cells usually showing a distinct spiral twist, the basal wall-cells forming a hyaline or less deeply suffused neck; the tip wholly black except the lip-edges, which may be translucent brown and are more or less distinctly differentiated. Receptacle variable, minutely punctate, pale amber-brown or amber-yellow, gradually tapering from the base to the often relatively broad distal portion, or more commonly cells I and II forming a slender stalk above which the rest of the receptacle expands abruptly, the unmodified colorless triangular insertion-cell carried up and out free from the receptacle through the enlargement of cell V, the inner margin of which is mostly free. Outer appendage consisting of a series of about seven to ten obliquely superposed cells, each bearing distally and externally a single simple branch; the branches constricted at the first, second, and third septa, which are deeply blackened; the second less conspicuously, the basal and subbasal cells variably suffused with clear brown especially near the septa, the distal portion of the branch hyaline, tapering, somewhat inflated above its usually brown base: inner appendage consisting of a basal cell which gives rise on either side to a branch resembling the outer appendage, often with fewer cells (sometimes only 3-celled) similarly branched, except that the lower branch consists of a single cell which bears terminally a solitary antheridium that becomes brown; the outer appendage and the two branches of the inner erect and close together, or more or less strongly and irregularly divergent. Perithecia, average 200 × 52 μ (110–260 × 45–60 μ) including stalk. Total length to tip of perithecium 260–600 μ; to insertion-cell 185–370 μ; greatest width 65–100 μ. Appendages 220–330 μ.

On *Calophæna bifasciata* Oliv., Brit. Mus. No. 509, South America; on *Calophæna* sp., Brit. Mus. No. 512, Nanta, Amazon; on *C. bicinctus* Dej., Hope Collection, No. 268, Brit. Mus. 508, Columbia; on *Calophæna* sp., U. S. National Museum, Central America; Berlin Mus. No. 953, on *Calophæna bicinctus* Dej., Bogota.

The typical form of this species shows variations of no great importance, which are, for the most part, dependent on the variable development of its receptacle, of which fig. 15 shows an average form. Many, however, are more elongate, while very often a peculiar habit results from the fact that the two basal cells become abruptly distinguished from the distal portion, as a slender stalk. Individuals also occur in which the general form is quite normal, like other members of the *L. flagellata* type. A single small group of individuals obtained from the inferior surface of the prothorax of *Calophæna bifasciata* (Brit. Mus. No. 509), though otherwise similar to the type, possess a narrow black insertion cell: while on the legs of *Cordistes* (*Calophæna*) *bicinctus* Dej. (Hope Coll. No. 268) as well as from a Central American *Calophæna* in the U. S. Nat. Mus., No. 19, a well marked variety has been found, strikingly unlike the type from the fact that its more compact receptacle is, with the exception of its basal cell, deeply suffused with blackish brown, the suffusion involving the insertion-cell as well as the basal cells of the appendages.

The tip of the perithecium, in specimens in which the twist in the wall-cells is sufficient to give a posterior view, show a symmetrically bluntly bilobed outline, somewhat similar to that of *L. aristata* (Plate LX, figs. 27–29). The species is allied to *L. Helluomorphæ*, which is most easily distinguished by the black septum which subtends its antheridium, and also approaches *L. perplexa* in the tendency to diverge shown by the primary axes of its appendages; a character which is, however, not always pronounced.

LABOULBENIA HELLUOMORPHÆ Thaxter. Plate LXIII, figs. 13–14.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 42. June, 1902.

Perithecium straight or slightly divergent, hyaline to yellowish, becoming somewhat tinged with smoky brown; the basal wall-cells forming a scarcely apparent short stalk; the blackish tip abruptly distinguished; the coarse translucent lip-edges outwardly oblique. Receptacle normal, hyaline to straw-yellow, distally obscurely punctate and slightly suffused with faint brownish shades; cells III, IV and VI subequal; cell V rather large, its inner margin more than one half free, nearly vertical, the thick, black, slightly oblique insertion-cell thus free above the base of the perithecium. Basal cell large, more or less suffused with brown; the two or three cells above it obliquely superposed, hyaline; all the cells bearing distally and externally single simple branches, the basal part consisting of two cells, becoming clear brown, constricted at the dark septa; the distal part hyaline, or more faintly brownish, distinguished by a deep brown suffusion at the base: the inner appendage consisting of a very small hyaline basal cell, giving rise on either side to a very short branch, consisting of from one to two cells; the basal one bearing an antheridial branch, consisting of a single rather long cell terminated by a solitary brownish antheridium seated like the branch on a blackened septum. Spores 70 × 7 μ. Perithecia 130–140 × 35–40 μ. Receptacle 220–180 μ. Appendages 185–300 μ. Total length to tip of perithecium 290–325 μ.

On *Helluomorpha melanaria* Reiche, Ega, Amazon; British Museum, No. 527. On *Pleuracanthus brevicollis* Dej., Surinam; Berlin Museum, No. 942. On the elytra.

This species bears a general resemblance to small forms of both *L. triordinata* and *L. Trichognathi.* It is most easily distinguished from these, as well as from other known species of this section from the fact that not only the antheridial branch, but also the antheridium itself, is distinguished by a blackened septum. From *L. triordinata,* which it most nearly approaches, it is further distinguished by its normally black insertion-cell, and undeveloped inner primary appendages, which bear at most only two, or possibly very rarely, three, branches each.

LABOULBENIA MINIMALIS Thaxter. Plate LXII, figs. 10–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 188. Dec., 1899.

Perithecium free, becoming olivaceous to smoky brown, mostly straight, the basal wall-cells forming a very short stalk, the tip rather abruptly distinguished, mostly straight, symmetrical, black, distally hyaline. Receptacle olivaceous yellow with brown suffusions; cell I slightly suffused with brown, somewhat longer than cell II, both rather narrow; the receptacle expanding rather abruptly above cell II; cells III, IV, and V nearly equal becoming rather deeply suffused with brown. Insertion-cell broad, blackened. Outer appendage consisting of a large triangular basal cell becoming deep blackish brown, above which four to six small nearly hyaline cells obliquely superposed, or with their long axes nearly vertical, form a series which runs obliquely toward the perithecium, each cell producing externally a single simple branch consisting normally of three cells; the basal subhyaline, much longer (especially in the upper branches) than the subbasal, which is somewhat suffused, broader below, slightly inflated, distinguished above and below by blackened septa; the terminal cell short hyaline, mostly somewhat swollen and soon disorganized: the inner appendage consisting of a series of cells similar to that of the outer, usually four in number, each bearing an antheridial branch which consists of a subhyaline relatively long stalk-cell, seated on a blackened septum and bearing distally a pair of slightly divergent long brown antheridia about equalling the stalk-cell in length; their tips usually exceeding those of the sterile branches of the outer appendages. Perithecia 100–110 × 30 μ. Total length to tip of perithecium 200–250 μ, to insertion-cell 110–125 μ; greatest width 45 μ. Appendages 60–90 μ.

On *Galerita* sp. Paris Museum No. 74, Venezuela, on the mid-elytron. On a small species of *Galerita* with red prothorax from Guayaquil, Ecuador, Berlin Museum, No. 965.

This small species, of which sufficiently abundant and perfect material has been examined, is one of the most readily recognized members of this section, distinguished by its small size and the character of its antheridial branches, and its antheridia, which are relatively large, and usually exceed the sterile branches in length, a condition seen in no other species. The cells of the inner primary appendages may all bear such antheridial branches, but in a few instances the uppermost is replaced, as in fig. 11, by a sterile branch similar to those of the outer appendage. The perithecium is often more deeply suffused than is represented in the figures and the wall-cells seem, in old individuals, to be spirally twisted.

Laboulbenia Galeritæ Thaxter.

This fine species which is distinguished by its contrasting black and white color, black punctate perithecium, and normal receptacle in which cells III and IV are separated by a horizontal septum, is the common species on *Galerita* in temperate and tropical North America; but does not appear to extend south beyond the Isthmus, though specimens have been examined from Nicaragua and the West Indies. The antheridia appear to occur always in terminal groups of two or three. Additional material has been examined from the following sources. On *Galerita* sp., Iowa: on *G. Janus* Fabr., Illinois: on *G. Californica* Lec., California; U. S. Nat Mus., No. 47, *Galerita* sp., Florida. Hope Collection No. 253 on *G. atripes* Lec., Texas. Berlin Mus., No. 970 on *G. tenebriosa* Klg., Port au Prince, Haiti: No. 967 on *Galerita* sp., Nicaragua: Sharp Collection, No. 1192 on *G. Forreri* Bates, Presidio, Mexico. British Museum: No. 712 on *G. Mexicana*, Chaud., Oaxaca, Mexico, No. 711.

Laboulbenia subpunctata, nov. sp. Plate LXIV, figs. 5–6.

Perithecium relatively large, longer than, sometimes nearly twice as long as, the receptacle; usually straight, sometimes curved, cylindrical or slightly inflated, dirty yellow, becoming tinged more or less deeply with rather rich brown; the lower fifth or half, rarely more, flecked by scattered dark rounded spots, which are larger and more irregular in shape toward the base; the tip rather abruptly distinguished, mostly abruptly darker; the apex hyaline yellowish, the pore terminal, or slightly sublateral: a well distinguished hyaline stalk slightly narrower than the base of the perithecium, as a rule, its length not equalling its breadth. Receptacle normally relatively short and compact, the basal cell quite hyaline and contrasting abruptly with the deeply suffused subbasal cell from which it is obliquely separated, and below which it bulges more or less prominently on the posterior side: cells II and III becoming quite opaque, the former often projecting more or less conspicuously below the latter, which extends up to the lower outer angle of the insertion-cell, below which it forms a usually well defined rounded projection: cells IV and V becoming deeply suffused, but seldom opaque, their long axes parallel with that of cell III: cells II–V nearly hyaline immediately below the contrasting black insertion-cell: cell VI relatively long, somewhat less deeply suffused especially at its base, the cells above it somewhat prominent, concolorous, often flecked with darker irregular patches. Insertion-cell broad, black, the opacity involving the basal cells of the outer and inner appendages more or less completely; the former extending as a black rounded prominence external to the base of the branch (usually broken off) which it bears. The outer appendage consisting of about six very obliquely superposed cells, forming a compact series running inward toward the base of the perithecium, each bearing a single simple branch, the branches having a basal two-celled part, with constrictions at the blackened septa, clearly distinguished from a more elongate tapering distal hyaline portion, which extends not much above the upper third of the perithecium proper: inner appendage consisting of a basal cell, giving rise on either side to a series of cells so obliquely superposed that the long axis of the inner is nearly vertical; the three or four lower (outer) ones giving rise to antheridial branches, consisting of a basal cell about twice as long as broad, distinguished by a blackish basal septum, and bearing a relatively short strongly curved antheridium, exceeding it in length. Average length to tip of perithecium 400–450 μ (300–550 μ): to insertion-cell, average, 170 μ, greatest width about 70 μ. Length of perithecium, including stalk, 180×45–$270 \times 50\ \mu$, average $200 \times 40\ \mu$. Appendages, total length including insertion-cell, 125–150 μ, the sterile branches longest 120 μ. Spores $44 \times 5\ \mu$.

On *Galerita* sp., Rosario, Argentina. Paris Museum No. 160. On *Galerita* sp., Sierra Geral, Brazil, Berlin Museum No. 966 Type; on *Galerita carbonaria* Mannerh., Brazil, Berlin Museum No. 960: on *G. unicolor* Amazon, British Museum No. 516, and No. 517 (Brazil). Usually on the prothorax, inferior or superior, and head.

This species has been separated from *L. punctata* to which it is very closely allied, and for which it might readily be mistaken, chiefly for the reason that its appendages and antheridia appear to be constantly different. The antheridia and their stalk cells are relatively short, the former strongly curved, while in *L. punctata* they are straight, very long, and borne on long stalk-cells. The branches of the outer appendage, which in *L. punctata* scarcely exceed the tips of the antheridia and are not distinguished by a basal and terminal portion, are distinctly thus distinguished in the present species, in which the three lower septa, only, are suffused; while this is the case with all the septa in *L. punctata*. The suffusion of the basal cells of the appendages which are indistinguishable from the insertion-cell, the external prominences formed by the basal cell of the outer appendage, and by cell III, give the individuals a peculiar habit unlike that of *L. punctata*. The material of the two species, as well as the sources from which it has been derived, are sufficiently varied to determine the constancy of the differences indicated. In a few individuals cell II of the receptacle is not opaque at maturity, but merely suffused and coarsely punctate. In some individuals the punctation of the perithecium may be almost obsolete, and is very rarely as general as in *L. punctata*.

Laboulbenia punctata Thaxter. Plate LXIV, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 197. Dec., 1899.

Perithecium free, straight, translucent brown, sometimes becoming almost opaque, except the broad short neck formed by the basal wall-cells, which is nearly hyaline and as broad as the ascigerous portion; the lower half or more of the suffused body of the perithecium covered with irregular more or less rounded dark spots, irregularly distributed, the lower larger; the tip rather abruptly distinguished, narrow, black, distally translucent. Receptacle rather short and stout, the basal cell rather narrow and hyaline or yellowish, contrasting; the rest of the receptacle subtriangular and more or less deeply suffused; cell VI paler, cells III and IV side by side, nearly vertical, deeply suffused, except the upper edge; cell V relatively large, subhemispherical, becoming opaque; all the suffused cells where not opaque, more or less conspicuously and rather coarsely punctate. Insertion-cell very broad, black, close beside the base of the perithecial stalk. Outer appendage consisting of a large triangular basal cell externally blackish brown, forming the base of a series of (eight or less) much smaller cells obliquely superposed, which curves toward the perithecium; each cell producing externally a single simple erect branch, rather closely septate, the (usually six) septa dark, constricted, the terminal cell short with rounded apex. The inner appendage consisting of a basal cell giving rise to a series of cells on either side like that of the outer appendage, but shorter, one to three of the lower branches consisting of a single long cell bearing terminally a long slender flask-shaped brown antheridium. Perithecia 200–220 × 40 μ; smaller 130 × 48 μ (including the neck about 35 μ). Total length to tip of perithecium, average 350 μ; to insertion-cell 145 μ; greatest width 75 μ. Appendages 110–130 μ.

On *Galerita* sp., Paris Museum, No. 74, Venezuela, No. 136, "South America." On head of *G. pallidicornis* Reid. (= *G. Moritzi* Mann.), Columbia, Berlin Museum No. 968.

The perithecium of this species possesses the same peculiar dirty yellowish coloring, often obscured by brown suffusions, which characterizes that of *L. subpunctata*, as well as the peculiar irregular coarse punctation which is much less well marked in the last mentioned species. The undifferentiated branches of the appendages, the cells of which are all distinguished by dark septa; the long stalk-cells of the antheridia, the tips of which nearly reach the tips of the sterile branches; the form and coloration of the basal cells of the appendages, as well as of the receptacle, and to a less extent the broader stalk of the perithecium, are characters which serve to separate the present species from its near ally.

LABOULBENIA FUSIFORMIS Thaxter. Plate LXIV, fig. 4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 39. June, 1902.

Perithecium relatively long and slender, becoming nearly opaque and marked by scattered blackish points more conspicuous near the base, sometimes nearly obsolete, erect, or slightly divergent above the stalk, straight, subfusiform; the basal wall-cells forming a short hyaline stalk; the tip often rather abruptly differentiated, darker, often curved outward; the lips suffused, or the edges hyaline. Receptacle very long and slender; the basal cell short, nearly hyaline; the rest pale dull brownish, indistinctly transversely striate-punctate; cell II very long, isodiametric, throughout, except where its distal end is obliquely overlapped for a short distance by cell VI, separated by a short horizontal septum from cell III, which is much elongated and is separated from cell IV by an oblique septum, above which the receptacle shows a slight but abrupt contraction in diameter; cell IV more than twice as long as cell V. Insertion-cell black and thick, the blackening involving the greater portion of the basal cell of the outer appendage. Appendages very similar to those of *L. perplexa*, the basal cells of the branches somewhat darker, the distal part somewhat shorter. Spores 90 × 7 μ. Perithecia 450–580 × 60–75 μ including stalk (40 μ). Receptacle 500 μ to over 1 mm. × 70–75 μ. Appendages 275–375 μ. Total length to tip of perithecium 1.65 mm.

On the inferior surface of the prothorax of *Galerita carbonaria* Mannerh., Brazil; Berlin Museum, No. 960.

This species is so large that it has been necessary to reduce to × 150 the magnification (× 260) used in figuring its allies. Although apparently so well distinguished, especially by its very peculiar, usually distinctly punctate, perithecium, I feel uncertain whether it may not possibly prove no more than a variety of *L. perplexa*, brought about, perhaps, by more abundant nutrition, afforded by its position of growth on the host. It was found associated with *L. perplexa*, *L. incerta*, *L. corniculata*, and *L. bicolor* on the same individual.

LABOULBENIA PERPLEXA Thaxter. Plate LXIII, fig. 18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 49. June, 1902.

Perithecium very large and long, not twice as long as the receptacle, dull translucent olive-brown, or becoming blackish brown, straight, usually erect, nearly isodiametric, or often subclavate, tapering slightly below to a short rather narrow hyaline contrasting stalk formed by the basal wall-cells; the subbasal wall-cells slightly spiral, making from one quarter to one half a turn; the tip short, blunt, blackish, generally not well distinguished, sometimes bent rather abruptly inward. Receptacle short, the basal cell nearly hyaline, somewhat elongate, the rest of the receptacle hardly exceeding it in length, dirty olive brown, becoming more deeply suffused with brown or blackish brown and somewhat mottled; cell II small, separated from cells III and VI by very oblique septa, its lower third or fourth, only, free; cells II, III, VI and often IV not differing greatly in size, their inner angles often converging to a common point at about the centre of the distal portion of the receptacle; cell III triangular or subtriangular, extending upward to a point just below the insertion-cell, and downward often nearly to the base of cell II; cell V but slightly smaller than cell IV. Insertion-cell slightly oblique, well defined, rather thick, broad, black. Appendages corresponding in type to those of *L. Galeritæ*, hyaline, or the lower cells becoming suffused more or less, but not deeply, with brown; the outer and inner free above the base, usually divergent; the outer consisting of from six to sometimes ten or more obliquely superposed cells each of which bears externally a simple branch consisting of a two-celled basal part, the cells slightly longer than broad, constricted at the dark septa, clear brown; the distal part long, becoming slender, flexuous and hyaline toward its extremity, which may reach, or even exceed, the tip of the perithecium. The basal cell of the inner appendage producing a free branch on either side similar to the outer appendage, and bearing similar branchlets; except that the lowest, and usually the next above it, consist of single cells bearing terminally single brownish slightly curved antheridia. Spores 90 × 7 μ. Perithecia 290–360

× 50–60 μ, including the stalk (40 μ). Receptacle 220 × 60–70 μ. Appendages including branches 200–360 μ. Total length to tip of perithecium, average, 500 μ.

On the elytra and prothorax of *Galerita carbonaria* Mannerh., Brazil; Berlin Museum, No. 960.

This species, as I have noted above, may prove to be nothing more than the ordinary typical condition of a species in which a tendency to considerable variation culminates in the form described as *L. fusiformis*; and even *L. incerta,* despite the essential difference in the cell arrangement of its receptacle and its different type of perithecium may have to be united with it. As may be seen from the illustrations, however, the differences between these forms are sufficiently striking, and appear to warrant at least their provisional separation. Though quite unlike it in other respects *L. perplexa* resembles *L. triordinata* in the free vertical development of its primary appendages, and their divergence which is usually well marked.

Laboulbenia decipiens Thaxter. Plate LXIV, figs. 11–12.

Since it was originally described, a considerable amount of material of this species has been examined from various localities, as well as additional specimens from the original source. The original figure represents the maximum development of older individuals, in which the perithecium may become a dark olivaceous brown; but in general the brown coloration is not well marked, being replaced by olivaceous shades. There is considerable variation in the suffusions of the receptacle, which may be nearly hyaline, as well as in the prominence of the opacity of the basal cells of the appendages. A reexamination of the specimen from which the original figure was drawn, in which the appendages were badly broken and confused, shows further that the drawing is incorrect in that it represents the third and fourth branches of the inner appendage as of the sterile type. As a matter of fact in well developed specimens four, or even five, of the lower branches of the inner appendage may be antheridial, and in ordinary cases there are at least three such antheridial branches.

In South America the species varies to a usually smaller and more olivaceous form, fig. 12, and specimens from three sources on the upper Amazon, fig. 11, tend to vary, in that cells III–V are replaced by two cells; but individuals occasionally occur in this material having the normal number and arrangement. The receptacle apparently never becomes elongate and is often very short and compact. The twist in the perithecial wall-cells is always pronounced and characteristic, although it might readily be overlooked in paler specimens. The appendages in smaller forms are apt to become more elongate than in the larger, and may reach a length of 300 μ. An examination of over one hundred and fifty specimens shows an extreme variation in length from 675 μ in one specimen, to 225 μ, the Amazon specimens being usually smaller on the average.

Laboulbenia Argentinensis described by Spegazzini in the Anales del Museo Nacional de Buenos Aires, Tomo VIII (Ser. 3a, t. I) p. 79, of which the author has kindly furnished me an original sketch, appears to be one of the forms of the present species. Although it was described as occurring on a species of *Brachinus,* there seems to have been confusion as to the nature of the host, which was, with little doubt, the common *Galerita* of middle Argentina. The types have unfortunately been lost, so that there is no way of verifying the above reference. As sketched, the tip of the stalked perithecium is more blunt, the spiral wall-cells are not indicated, the sterile appendages are represented as moniliform throughout, though evidently broken, the antheridia large and sessile, the receptacle, however, just as in typical *L. confusa.* The original description is not intelligible and it would be quite impossible to determine the species from it.

The sources of the additional material of *L. decipiens* above referred to are as follows: U. S. National Museum; on *Galerita nigra* Chev., Paso Antonio, Guatemala; also No. 18, Maracaibo, Brazil. From the British Museum No. 708, on *G. æquinoctialis* Chd., Vera Paz, Guatemala; No. 518, on *G. unicolor* Dej., Amazon; No. 957 on *G. porcata* Kl., Cametá, Brazil; No. 963 on *G. striata* Klg., Port au Prince, Haiti; No. 958 on *G. melanaria* Erichs, British Guiana; No. 964 on *Galerita* sp., Columbia; No. 966 on *Galerita* sp., Sierra Geral, Brazil.

Laboulbenia bicolor nov. sp. Plate LXII, figs. 13–15.

Perithecium free, subisodiametric throughout, or with a slight general inflation, rich dark clear brown becoming almost opaque, often darker on the inner half, more or less granular; the granulation coarser at the base: the tip short, abruptly distinguished, broad, suffused, the inner lip often more prominent and hyaline: a clearly defined short hyaline stalk. Receptacle consisting of a contrasting hyaline basal cell as long as the balance of the receptacle, or nearly equalling it in length: cell III extending upward beside cell IV, its apex forming a prominence just below and external to the insertion-cell: cell II abruptly narrower than cell I, which is prominent below it, especially on the posterior side, opaque, the opacity involving finally cells II–VI, which usually remain more or less hyaline distally. Insertion-cell broad and black, continuous with the opaque basal cell of the outer appendage, which forms a more or less conspicuously developed upcurved external prominence, bearing the lower branch of the appendage, which is further composed of three or four obliquely superposed cells each bearing a single simple branch: the branches consisting of a basal and distal portion, the former two celled, the cells short inflated and distinguished by suffused septa; the latter unicellular, or spuriously septate, tapering, faintly brownish, or hyaline, mostly considerably shorter than the receptacle: the inner appendages consisting of a basal cell wholly or only partly suffused, the rest of the appendage consisting of about four hyaline obliquely superposed cells, bearing simple branches similar to those of the outer appendage; except that the basal and subbasal cells give rise to short stalk-cells, with single terminal antheridia; the latter with rather long curved slender necks, the base usually somewhat inflated, often broader than the stalk-cell, which is seated on a blackened septum. Perithecia, exclusive of stalk (18 μ), type-form 125–150 × 18–32 μ; larger form 180–225 × 45 μ. Receptacle, type-form 100–125 × 35–40 μ; larger form 100–150 × 55–65 μ. Appendages 125–150 μ. Total length to tip of perithecium, type-form 275–300 μ, larger form 325–400 μ. Spores type-form 50 × 5 μ, larger form 65 × 6 μ.

Type on a slender black *Galerita*, Paris Museum No. 73 Venezuela. Larger form on *Galerita carbonaria* Mannerh., Berlin Museum No. 960, Brazil. On the legs.

I have considered the smaller and more slender form from Venezuela as representing the type of this species (fig. 14), but although the Brazilian type presents constant differences in general size form and in the detail of the appendages, I think it should not be separated, even as a variety. It is conspicuous for the black and white effect of the contrasting regions of the perithecium and receptacle, which has suggested the specific name. The suffused portions of the receptacle, before becoming opaque, are usually more or less conspicuously mottled or punctate with darker flecks.

LABOULBENIA COLPODIS Thaxter. Plate LXII, fig. 16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 166. Dec., 1899.

Perithecium wholly free, very large, uniform clear translucent brown, slightly inflated or the margins straight, the basal wall-cells forming a well marked hyaline neck as broad as the base of the ascigerous portion from which it is not abruptly distinguished; the tip rather narrow and well distinguished, darker, the distinct lip-edges hyaline or translucent. Receptacle very small, cell I hyaline or yellowish, the rest more or less deeply suffused with blackish brown becoming nearly opaque, especially cells III and IV, which lie side by side and are about equal in size, cell III forming a rounded prominence just below the outer edge of the insertion-cell, cell V triangular, about as large as cells III and V combined. Insertion-cell very broad, thin, oblique not at first deeply blackened, but becoming indistinguishable in the general blackish brown suffusion of the adjacent cells. Outer appendage consisting of a nearly erect series of obliquely superposed small cells (sometimes as many as thirteen) at first hyaline, the basal cell and sometimes several of the cells above it becoming more or less suffused, each producing externally a single simple branch, curved upward, its basal portion consisting of two cells, sometimes three, longer than broad and more or less deeply suffused with brown, constricted at the dark septa; its distal portion elongate, reaching nearly to the tip of the perithecium, strongly tapering, hyaline, except at its base where it is involved by the brown suffusion of the basal part: the inner appendage consisting of a basal cell giving rise on either side to an inner and an outer nearly horizontal series of cells similar to that of the outer appendage, but fewer in number, similarly branched except that the two or three lowest cells of each series bear single large stout straight brown antheridia on undifferentiated concolorous stalk-cells, the basal cells of the series, as in the outer appendage, becoming suffused with blackish brown. Perithecia 190–220 × 40-50 μ. Total length to tip of perithecium 300–375 μ; to insertion-cell 75-80 μ; greatest width 55 μ. Appendages, longest 220 μ. Spores (in perithecia) about 50–55 × 6 μ.

On elytra of *Colpodes Chiriquinus* Bates, Brit. Mus. No. 735 (Biologia Coll.), Volcan de Chiriqui, Panama.

This well marked species is represented by four individuals, only, in the material available. The inner appendage appears to be proliferous above its base, and thus to become double, bearing two sets of antheridia and sterile branches, an inner and an outer; the latter arising from basal cells that are nearly horizontally placed. The basal region of the inner appendage is therefore very broad and cell V of the receptacle is correspondingly large, larger than cells II, III, or IV. The tendency of the inner appendage to proliferate recalls the conditions seen in *L. Trichognathi*, though the two species are quite unrelated in the section. The insertion-cell may be without any of the usually opaque suffusion, but varies in this respect.

Laboulbenia curvata Thaxter. Plate LXII, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 33. June, 1902.

Perithecium large and long, strongly curved inward throughout, rich deep red-brown, the inner half usually opaque, the outer more or less translucent or becoming opaque; the basal wall-cell forming a well-defined, short, hyaline stalk; the tip short and broad, suffused about the terminal nearly median pore. Receptacle short and stout, translucent, more or less deeply and unevenly suffused with dirty brown; the basal cell paler, or nearly hyaline below, often as long as the rest of the receptacle above it, obscurely punctate; the subbasal cell short, a very small part, only, of its anterior margin free; cells III and IV subequal, or cell IV larger, separated by a very oblique septum, a small portion only of the outer margin of cell IV free externally. Insertion-cell slightly oblique, brown or black, the suffusion involving the basal and even the subbasal cells of the appendages. Appendages consisting of from six to eight obliquely superposed cells, the branchlets usually much shorter than the perithecium, the two lowest cells of the inner appendage bearing antheridial branchlets consisting of a relatively large subhyaline stalk-cell bearing terminally a pair of deep brown divergent relatively small antheridia, the long slender necks curved rather abruptly distally. Spores 70–75 × 4 μ. Perithecia 325–400 × 50–70 μ, including the stalk (40–55 μ). Receptacle 185–220 × 75–90 μ. Total length to tip of perithecium 500-600 μ.

At base of anterior legs of *Galerita carbonaria* Mannerh., Brazil; Berlin Museum, No. 960: and of *Galerita* sp., Hope Coll., No. 259.

This species is distinguished by its almost falcate habit, the outer and inner halves of the large curved perithecium translucent and opaque, respectively, and distinguished by a more or less clean line of demarcation; although, in older individuals, the outer half may also become rather deeply suffused. The appendages in general resemble those of *L. perplexa* very closely, but are at once distinguished by the antheridial branchlets, and the antheridia; the latter being small, with very slender necks, and borne in terminal pairs. The Berlin material is taken as the type of the species, but the material from the Hope Collection, the locality of which was not indicated on the host label, agrees in every respect.

Laboulbenia pygmæa Thaxter. Plate LXII, fig. 6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 198. Dec., 1899.

Perithecium dark brown becoming almost opaque, coarsely granular-punctate throughout, somewhat more densely below, the basal wall-cells forming a well defined hyaline contrasting short neck slightly narrower than the body of the perithecium, the tip usually not very abruptly distinguished and bent very slightly outward, or straight, rather blunt; the lip-edges translucent, the lip-cells rather prominent, blackened below, especially on the inner side. Receptacle short coarsely punctate, triangular, cell I short, slender, curved, hyaline at the base, distally becoming suffused and finally indistinguishable from cell II, which is finally wholly opaque. Cells III and IV elongated and lying obliquely side by side, cell III forming a more or less prominent rounded projection below the apex of cell IV which also forms a slight external prominence just below the insertion-cell, both cells coarsely punctate, becoming opaque; cell V rather large, at first hyaline, becoming later suffused with brown; cell VI and the other cells below the perithecial neck coarsely punctate transluscent. Insertion-cell black, very broad, often becoming indistinguishable from the basal cells of the appendage. Outer appendage consisting of a subtriangular basal cell distally rounded, becoming deeply suffused with blackish brown, prominent externally and coarsely punctate; surmounted by a series of obliquely superposed cells close set, their long (transverse) axes sometimes almost perpendicular, each bearing externally a single simple branch, the two lower cells of which are longer than broad, tinged with brown, the septa dark and often oblique; the distal portion hyaline, twice as long, blunt-tipped: the inner appendage consisting of a smaller basal cell also becoming punctate and almost entirely suffused, surmounted on either side by a series of cells like that of the outer appendage and similarly branched, except that the two or three lowest cells of the series bear a short one-celled branch terminated by usually three slightly curved brown antheridia. Spores 52 × 4 μ. Perithecia 110 × 22–150 × 33 μ, exclusive of neck which is 20–30 μ. Total length to tip of perithecium 175–300 μ; to insertion-cell about 90–110 μ; greatest width 40–55 μ. Appendages 90–130 μ.

On *Trichognathus* sp., Paris Museum, No. 72, Venezuela. On *Galerita* sp., U. S. Nat. Museum No. 23, Bobo, Mexico. On *Galerita* sp. Berlin Museum No. 961, Mexico.

This species, which occurs on the legs, elytra, and other parts of the host, is distinguished by its short stout habit and densely black punctate perithecium, which is similar to that of *L. Galeritæ* in this respect. The specimens from Bobo are slightly more slender than the type material from Venezuela (Paris No. 72), the receptacle, above the basal cell, less triangular and less deeply suffused, but otherwise exactly similar. It is most nearly related to *L. media*, but is well distinguished by its smaller size, and especially by the different structure of the receptacle and basal portion of the appendages in the latter, and their relation to the insertion-cell.

Laboulbenia media Thaxter. Plate LXII, figs. 3–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 45. June, 1902.

Perithecium usually narrow, straight, erect, sometimes slightly inflated, the basal wall-cells forming a relatively long, well-distinguished, hyaline or subhyaline stalk; the basal cells vertically elongated; the ascigerous portion marked by distinct transverse blackish coarse granular striations throughout, and becoming opaque or nearly so; the tip erect, the apex slightly asymmetrical, subtended by a darker shade on the inner side. Receptacle medium to short, the basal cell hyaline, becoming dirty brownish yellow; cells III and IV deep brownish, the suffusion more or less confined to these cells or involving also cell II and other adjacent cells, the more deeply suffused parts coarsely punctate; cell III extending upward beside cell IV and distally forming a well-defined external prominence, sometimes as distinct as that formed by the basal cell of the outer appendage; cells V and VI wholly or partly hyaline becoming dirty brownish yellow, the latter coarsely punctate. Insertion-cell small, almost wholly external to cell V, hardly distinguishable, translucent and only finally involved in the opacity of the adjacent cells. The basal cell of the outer appendage large, subtriangular, forming distally and externally a rounded prominence, from the upper nearly horizontal surface of which arises the first of the oblique series of branches; the remaining cells of the appendage hyaline, very obliquely superposed successively smaller, from about six to ten in number, forming a series extending obliquely back to the perithecium, each bearing externally a single branch; the branches relatively short, the basal cell more elongated than the subbasal, both purplish brown, slightly constricted at the dark septa; the rest of the branch shorter or not much longer than the basal part and consisting of from one to three cells, hyaline or brown below, blunt-tipped; the basal cell of the inner appendage giving rise to the characteristic series of superposed ramiferous cells on either side like that of the outer appendage but nearly horizontal and extending inward well beyond the inner end of the insertion-cell, the four to six lower cells of each series producing, two, less often three, unicellular branchlets terminated by brown long-necked antheridia; the sterile branchlets of the upper and distal cells similar to those of the outer appendage. Spores 45 × 4.5 μ. Perithecia 180–290 × 40–48 μ, the stalk 55–125 × 25–35 μ. Receptacle 165–220 μ. Appendages, greatest total length, 165–185 μ. Total length to tip of perithecium 350–725 μ.

On *Galerita* sp. (tips of elytra), Venezuela; Paris Museum, No. 75. On tip of abdomen, inferior, of *Galerita Lecontei* Dej.: British Museum, No. 521, Costa Rica; No. 525 on *Trichognathus marginipennis* Latr. Tamas, ? Columbia, No. 526 on *T. marginatus* Latr., Brazil.

This fine species is distinguished from *L. pygmæa* especially, with which it was formerly in part confused, by the insertion of its appendages, the insertion-cell being unmodified and small, and finally continuous with the series of cells which form the primary inner appendages, the bases of which are in contact with cell V of the receptacle, except the uppermost (innermost).

LABOULBENIA PHEROPSOPHI Thaxter. Plate LXIV, figs. 8–9.

Since the original publication of this species, it has been possible to examine a considerable amount of additional material occurring on species of *Pheropsophus* from both hemispheres. The material from these sources is, in general, rather clearly distinguished, however; that from the western hemisphere adhering closely to the type as originally described, in which the outer appendage is at most not more than five or six times proliferous, that is the main axis consists of not more than five or six cells and is of compact habit: the inner appendage producing, as a rule, only a single branch with two or three proliferations, the axis thus only two- to three-celled; a small short stout solitary antheridium being borne on a short stalk-cell at its base. Material from the Eastern Hemisphere, though often closely resembling the type, especially in the African specimens, tends to vary to the condition shown in figure 8, the outer appendage, as well as the two branches of the inner, being much more luxuriantly developed and the antheridia (fig. 9) produced usually in groups of two or three, their form more slender and elongate, the necks curved. This is especially true of specimens from Madagascar, Ceylon, the Philippines, and localities to the east of Africa. The differences, however, are not sufficiently absolute to warrant even a varietal designation.

The additional material obtained is as follows: British Museum No. 534 on *P. fuscicollis* Dej., Java; No. 717 on *P. æquinoctialis* Linn., Yucatan; No. 718 on *P. biplagiatus* Chaud., Junquilla, Mexico: Paris Museum; No. 8 on *Pheropsophus* sp., Madagascar, and No. 14, Ceylon; No. 55 on *P. fuscicollis* Dej., Asia; No. 56 on *P. Latoni* Dej., Asia; No. 76 on *Pheropsophus* sp., Venezuela; No. 77 on *Pheropsophus* sp., Java: Berlin Museum; No. 995 on *P. obliquatus*, Kimpoko, Congo; No. 998 on *P. Kersteni* Gerst., Aruscha Kisnani, Africa; No. 1001 on *P. humeralis* Chaud., Madagascar; No. 1003 on *Pheropsophus* sp., Luzon, Philippines; No. 1005 on *P. bipartitus*, Madagascar. Hope Collection; No. 238 on *Pheropsophus* sp., Ceylon.

LABOULBENIA PACHYTELIS Thaxter.

This type proves to be a very variable one, in which species-making is going on in a fashion somewhat similar to that which is seen in the forms occurring on the closely related *Brachinus* and *Galerita*. I have separated as species three forms which are closely related in this group, *L. punctulata* from widely separated localities, *L. tortuosa* on our small western *Pachyteles*, and *L. Ozænæ* which has developed a very characteristic method of bearing its antheridia. It is probable that a fourth species is represented in material from the Amazon, as well as a fifth on *Pachyteles longicornis* from Mexico; but I have been unable to include figures of these forms which I hope to illustrate in a future paper. The variations among the more typical forms are in general associated with extreme differences in size, (the total length to tip of perithecium varying from 150 to 900 μ or more); in color; in the development of the outer appendage, which may be short and compact or elongate, consisting of only one or two cells or many celled; and in the relation of the perithecium to the receptacle, to which it is variably united.

Additional material has been examined as follows: British Museum No. 572 on *Ozæna parallela* W., Rio Janeiro; No. 574 on *Pachyteles* sp., Ega, Amazon; No. 573 on *Ozæna Reichii* Guer., Columbia; No. 672 on *Pachyteles Mexicanus* Chaud., Toxpain, Mexico; No. 671 on *P. seriatoporus* Chaud., Bugaba, Mexico. Hope Collection No. 281, on *Goniotropis rufipes* Hope, New Grenada; No. 280 on *P. Braziliensis* Gray, Brazil; No. 285 on *Pachyteles* sp., Brazil. In the Berlin Museum No. 945 on *Ozæna Reichii* Guer., New Grenada; No. 946 on *O. pedestris* N., Bogota Columbia; No. 948 on *O. glabra* Klg., Brazil. In U. S. National Museum No. 24 on *P. Mexicanus* Chaud., Mexico (very typical specimens).

Laboulbenia punctulata Thaxter. Plate LXIII, fig. 12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 197. Dec., 1899.

Perithecium about three fourths free, dark brown, translucent, curved toward the appendages which cross it obliquely, the broad short flat-topped snout-like tip slightly upcurved. Receptacle short and stout, the basal cell small, short, hyaline, contrasting, the rest concolorous with the perithecium, but darker and distinctly punctate with dark brown spots. Outer appendage consisting of a series of from three to about six successively smaller superposed cells, from each of which a simple tapering brown branch arises, blackened about its subbasal septum, the successive branches superposed in a vertical external row, the basal cell of the inner appendage producing usually a short one-celled antheridial branch bearing a single small antheridium. Perithecia 120 × 45 μ. Total length to tip of perithecium 200–220 μ; to insertion-cell 125 μ. Appendages 100–120 μ.

On *Pachyteles parallelus* Chaud., Brit. Mus. No. 575, Para: on *P. porrectus* Chaud., Brit. Mus. No. 670 (Biologia Coll.), Pantaleon, Guatemala.

Although obtained from widely separated localities, this form, which occurs on the legs of its host, is in both instances very constant in its characters, and quite unlike small short forms of *L. Pachytelis* which are often found growing in a similar situation. Although its appendages are practically the same, its peculiar short hunched form, the shape of its perithecium, and the coarse punctation of its receptacle above the hyaline basal cell serve to distinguish it at once.

Laboulbenia Darwinii Thaxter. Plate LV, fig. 2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 170. Dec., 1899.

Perithecium hyaline becoming pale straw- or amber-yellow, sometimes with a shade of brown, relatively small, its upper third or less free from the receptacle, the tip black, abruptly distinguished, the broad lip-edges translucent purplish brown. Receptacle relatively stout, indistinctly punctate with short lines or dots of darker yellowish color, cells II, III, and IV often unusually broad. Insertion-cell well developed, deep purplish brown or black. Outer appendage consisting of a short angular brownish basal cell, which bears an outer and an inner branch distally, the outer simple or once branched above its basal cell, the inner mostly simple; the outer branchlet mostly shorter, divergent, often deeply suffused with reddish brown, the rest less deeply colored, rigid, erect. The inner appendage consisting of a smaller basal cell which may produce a single branch, or two placed laterally or antero-posteriorly, short, simple with lateral antheridia or once branched. Perithecia 100 × 30–35 μ. Total length to tip of perithecium 150–275 μ; to insertion-cell 135–250 μ. Appendages, longest 200–250 μ.

On *Ozæna parallela* W., Brit. Mus. No. 572, Rio de Janeiro (legit C. Darwin); on *O. lævis* Klg., same locality, Berlin Museum No. 947: on *Pachyteles* spp.; Paris Mus. No. 137, South America, Hope Collection, Nos. 284 and 285, Brazil. Occurring usually at the base of the posterior legs or margins of elytra.

This species, which appears in general to be a well defined form, is perhaps the representative of the *flagellata*-like type from which the other forms on *Pachyteles* and its allies have been derived. The only distinct variation from the type represented in fig. 2 is seen in two or three specimens obtained from *O. lævis*, collected at Rio Janeiro, in which cell V is abnormally protruded within the insertion-cell and even divided, as in *L. proliferans*. Its color is very pale, and the appendages are too much broken for comparison, but it hardly seems distinct. The type is most readily distinguished by its stout receptacle, cells III and IV being especially large, and its relatively very small perithecium, which is almost wholly adnate to the receptacle, except the tip. The type is derived from a host collected by Charles Darwin on his famous "Voyage of the Beagle."

Laboulbenia Ozænæ nov. sp. Plate LXIII, Fig. 11.

Rather evenly suffused with dirty yellowish, faintly shaded with brown. Perithecium more than half free, relatively small; the tip relatively large; the lips prominent, transparent, subtended by blackish brown suffusions. Receptacle normal, cells I and II subequal, cells III–IV not much smaller and subequal, the external walls suffused with brown; cell V triangular, its upper margin oblique. Outer appendage consisting of usually three cells obliquely superposed, the upper bearing two, the rest bearing externally single tapering simple branches about equal to the perithecium in length, distally hyaline; below, externally and at the base, suffused with rather deep blackish brown: inner appendage consisting of a basal cell which gives rise to an antheridial branch, occasionally on both sides, which sometimes arises at the base of a short sterile branch; the antheridial branch consisting of a single stalk-cell, constricted at its deeply blackened base, above which it is abruptly inflated, assuming a spherical form and bearing three or four large antheridia side by side in a fan-like fashion, their slender tips reaching to the apex of the perithecium. Insertion-cell translucent reddish brown, rather broad and oblique. Total length to tip of perithecium 220 μ; greatest width about 60 μ. Perithecium 90–100 × 30–32 μ. Receptacle to apex of cell V, about 150 μ. Antheridia 36 μ. Spores about 55 × 5 μ.

On *Ozæna angulicollis* Schm., Berlin Museum, No. 944, Venezuela. This species occurred at the tips of the elytra of its host and is very clearly distinguished, by its peculiar antheridial branches and large antheridia, from the other forms (*L. Pachytelis, L. punctulata* and *L. tortuosa*) occurring on *Pachyteles* and its allies. The types show very little variation in form, size or color. In a few individuals the inner appendage gives rise to two sterile branches, one on either side, from the bases of which the antheridial branchlets arise.

LABOULBENIA TORTUOSA Thaxter. Plate LXIII, fig. 10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 206. Dec., 1899.

Perithecium with hardly more than the tip free, relatively small, externally suffused with smoky brown and concave through the presence of a well defined subterminal hunch, above which the somewhat pointed well defined outwardly oblique blackish-brown tip is abruptly differentiated, the lip-edges pale brown translucent. Receptacle very pale reddish or yellowish, variously bent, sometimes at right angles or at an angle of forty-five degrees above cell II; cells I and II straight or more frequently cell II curved strongly, while there is often a less pronounced curvature in the opposite direction immediately above it. Insertion-cell horizontal, about opposite the external hunch of the perithecium. Outer appendage consisting of a very large basal and somewhat broader subbasal cell, the two commonly as broad as or broader than any portion of the receptacle with which they are concolorous; the upper outer angle of both cells marked by the black insertion of a short simple branch, usually broken off, the subbasal cell surmounted by a small flattish cell which bears a simple terminal branch with blackened base like those developed laterally below it: the inner appendage consists of a very small basal cell which usually produces a pair of relatively large antheridia with inflated venters and brown necks distinguished by a deeply blackened basal septum. Perithecia 85 × 27 μ. Total length to tip of perithecium about 275 μ. Appendage, to upper blackened septum 50 μ, by 28 μ wide. Spores about 55 × 5 μ (in perithecium).

On *Pachyteles testaceus* Horn, U. S. National Museum, No. 28, Arizona. Along the adjacent inferior margins of the thorax and prothorax, on left side.

This species, though closely allied to *L. Pachytelis*, of which it might at first sight appear to be an abnormal development, was found on several specimens of this small Arizona *Pachyteles*, always in the same general position and in no case varying from the type form illustrated in Fig. 10. The antheridial branch occupies a median position, the two antheridia diverging slightly on either side, and apparently arising from a very small stalk-cell. Its abnormally bent habit, its pointed and hunched perithecium, and its inflated primary outer appendage, consisting of two similar cells, basal and subbasal, distinguish it clearly from *L. punctulata*, *L. Ozanæ* and *L. Pachytelis* which are its nearest allies.

LABOULBENIA TEXANA Thaxter.

The type form of this striking species has not again been observed since the original material was obtained on species of *Brachinus* from Texas and Guatemala; but a number of forms on *Brachinus* which approach it perhaps too closely for specific separation, have been distinguished as varieties. The type forms of these varieties, though occurring in widely separated localities, are absolutely identical, and show scarcely any variation and the same is true of the form previously described as *L. rostellata*, individuals from Florida and from Montevideo being identical. The series of varieties as a whole, however, shows certain gradations between extreme forms, and the character of the appendages, although subject to peculiar variations in luxuriance of development is, on the whole, so constant that I have concluded to retain varietal designations in all cases. This disposition of the forms must be, nevertheless, considered as provisional; and further study of material from the La Plata region, as yet unexamined, may indicate that a revision of this opinion is desirable. The present species is so closely allied to *L. Pachytelis*, which also occurs on an allied host, that it would be difficult to distinguish a variety like *retusa* from some of its many variations. The varieties illustrated in the accompanying figures which have been greatly reduced (× 150) as compared with the other figures of the plate, may be distinguished as follows:

Var. ROSTELLATA Thaxter. Plate LXIII, fig. 5.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 55. June, 1902. L. c., Vol. XXXV, p. 199. Dec., 1899, as *L. rostellata* n. s.

Perithecium about one half free, becoming more or less deeply suffused with blackish brown, relatively small, narrow and curved toward the appendages, distally monstrously developed, bulging terminally and externally to form a rounded prominence from the inner side of which the tip projects inward in the form of a blunt pointed, blackened outgrowth, the hyaline contrasting apex of which is bent slightly upward. Receptacle more or less suffused, sometimes deeply colored with blackish brown, cells I and II paler, slender, of nearly equal width, cell II longer; cells IV and V very broad, carrying out the insertion-cell free from the receptacle so that it becomes oblique or even vertical and lateral. Outer and inner appendages similar, bent away from the perithecium, their bases overlapping; consisting of a series of superposed cells which are successively smaller from below up, each bearing distally and externally a short tapering branch; all the branches brown, the subbasal septa blackened, all simple except the lower branch of the outer appendage which bears two or three short branchlets; the basal cell of the inner appendage bears a short antheridial branch from its inner side; the outer appendage somewhat longer than the inner, the superposed cells usually eight in number. Perithecia 140–190 × 40–50 μ. Total length to tip of perithecium 400-550 μ; to insertion-cell 270–450 μ. Appendages, 140–170 μ. Tip of perithecium, including outgrowth, 50–60 μ.

On *Brachinus lateralis* Dej., Hope Coll. No. 246, "North America"; on *Brachinus* sp., Eustis, Florida, October; on *B. geniculatus* Dej., Berlin Museum No. 992, Montevideo, Uruguay. At base of anterior legs.

Specimens from the localities mentioned are remarkably constant in character, the subbasal and basal cells of the receptacle, however, usually forming a stalk which is more abruptly differentiated from the distal portion than is indicated by the individual represented in fig. 5.

Var. PENDULA Thaxter. Plate LXIII, fig. 3.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 55. June, 1902.

Longer and more slender than the type; cell V not greatly broadened, so that the perithecium and appendage diverge but slightly. The outer appendage nearly erect, brown, relatively very long, tapering; one or sometimes more than one of the three lower cells producing externally or laterally well-developed branches of the characteristic type, which are long, slender and more or less pendulous. The inner appendage recurved, more or less pendulous, relatively slender and similar to a well-developed branch which arises on its inner side from the third cell above its base. Perithecium nearly erect, the tip well distinguished, bent slightly inward; the lips somewhat spreading. On *Brachinus geniculatus* Dej., Montevideo, Uruguay; Berlin Museum, No. 992. On the inferior surface of the prothorax.

A very large and striking form, to which the pendent branches of its appendages give a graceful habit. Unlike the *var. incurvata,* which occurs with it, the two basal cells do not form a stalk clearly distinguished from the distal portion of the receptacle, and although cells IV and V are greatly enlarged, they are so arranged as to bear the appendages in the usual vertical position.

Var. **Oaxacana** nov. var. Plate LXIII, fig. 7.

Perithecium suffused with rather dark brown, tapering and curved slightly inward from about the middle to the tip, which is abruptly distinguished, subcapitate, the lips translucent only about the pore. Receptacle somewhat bent, the subbasal cell broader and several times longer than the basal cell; both evenly suffused with pale dirty brownish and contrasting in color with the darker brown distal portion, which is concolorous with the perithecium, except cell V, which is somewhat paler, indistinctly marked by transverse striæ, and prolonged upward and outward beside cell IV, carrying the insertion-cell out free from the perithecium almost horizontally. Outer appendage long tapering and slender, the lower half suffused with dirty brown, the distal hyaline; the successive cells bearing distally and externally small branches without blackened basal septa. Total length to tip of perithecium 550 μ. Perithecium 200 × 85 μ. Appendage 400 μ. Receptacle to insertion cell 470 μ. Spores 60 × 5 μ. Inner appendage consisting of a basal cell which gives rise laterally to a single small antheridium on a very short stalk-cell, and a hyaline terminal branch of five or six cells each bearing an upcurved branch; the branches producing upcurved branchlets, the lowest of which is distinguished by a blackened septum.

On the inferior surface of the prothorax of *Brachinus lateralis* Dej., Oaxaca, Mexico, British Museum No. 721.

The single type of this variety which has been examined, approaches var. *pendula* in the form of its perithecium, but differs both in the form of its appendages and in their relation to the receptacle, through the modification of cells IV and V.

Var. INCURVATA Thaxter. Plate LXIII, fig. 4.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 55. June, 1902.

Corresponding closely to the type in the form and coloration of the receptacle. The outer appendage nearly straight, divergent, hardly incurved, becoming more or less brownish, relatively somewhat longer and more tapering than in the type, the subbasal cell producing from its left side a short well-developed five- to six-celled branch, recurved, and bearing branchlets of the characteristic type from its convex side; the second cell producing on its concave side a two-celled branchlet, the lower cell of which bears one and the distal two of the characteristic branchlets. The inner appendage closely resembling that of the type, hyaline, incurved, its third cell producing a well-developed similar branchlet from its concave side. Perithecium as in the type, but the tip quite different, narrow, bent abruptly inward at right angles, the lips compressed. On *Brachinus geniculatus* Dej., Montevideo, Uruguay; Berlin Museum, No. 992.

While the appendages of this variety are not unlike those of the var. *pendula,* it differs in the form of the perithecium, with its abruptly inbent tip, and in the differentiation of the receptacle into a stalk-part, consisting of cells I and II, which is very abruptly distinguished from the subtriangular distal part: cells IV and V lying almost horizontally, instead of vertically.

Var. **retusa** nov. var. Plate LXIII, fig. 6.

Perithecium short stout somewhat inflated, becoming deeply suffused with smoky brown; the tip opaque, except for the translucent lip-edges and erect, or usually bent slightly outward. Receptacle becoming rather evenly suffused with dirty brown, paler or hyaline at the base, and sometimes with an olivaceous tinge; the basal and distal portions rather variably distinguished, cells IV and V considerably enlarged and elongated, carrying the insertion-cell out free from the perithecium. Appendages rather closely septate, the successive cells bearing the usual series of branches externally, which are simple and distinguished by a black septum at the base, the inner appendage shorter and more slender than the outer, but otherwise similar. Spores about 70 × 5.5 μ. Perithecium 150 × 60 μ. Total length to tip of perithecium 200–300 μ. Receptacle to insertion-cell 275–360 μ. Appendages total length 180–280 μ.

At the base of the anterior legs and on the adjacent inferior surface of the prothorax of *Brachinus* sp., Eustis, Fla., and from Argentina.

This variety approaches forms of *L. Pachytelis* so closely that it might almost be regarded as a variety of that species, and certainly would be, did it occur on the same host. The material from Eustis, which is taken as the Type, differs to some extent from the Argentine specimens, which have an olivaceous caste, are shorter, with a receptacle which is basally more slender and distally more conspicuously enlarged; the tip of the perithecium being not as stout and less rounded and the appendages longer and more slender than in the type, which is represented in fig. 6.

Var. TIBIALIS Thaxter. Plate LXIII, figs. 8–9.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 205. Dec., 1899.

Perithecium deeply suffused with blackish brown, somewhat inflated, the small tip rather abruptly distinguished. Receptacle stout, deeply suffused with blackish brown except cells I and II, which are hyaline or nearly so, abruptly contrasting, and cell V which together with the adjacent portions of cell IV is yellowish; cells IV and V broad, the insertion-cell broad and in contact with the base of the perithecium. Appendages as in *L. rostellata* except that the inner is larger and longer than the outer without overlapping it at the base and the lower branch of the outer is simple. Perithecia 150–175 × 60–70 μ. Total length to tip of perithecium 300–325 μ; to insertion-cell 200–225 μ. Appendages exclusive of the branches, inner 100–120 μ, outer 85 μ.

On *Brachinus* sp., Eustis, Florida, October. On the legs.

This pedicolous variety is distinguished by its contrasting coloration, the short stout form of its perithecium and receptacle, cell IV of the latter being relatively very large, and cell II very small, about a third as large as the basal cell; the two contrasting abruptly with the deep black suffusion of cell III. The appendages are further unlike those of other varieties in that the outer is much smaller than the inner. A second variation is represented in fig. 8, which also occurs on the legs and is distinguished by its more compact form and the presence of a double hunch, which is developed externally below the tip of the perithecium. Whether these differences are constant is uncertain since only two individuals have been examined.

LABOULBENIA CAFII Thaxter. Plate LXIII, fig. 1–2.
Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 162. Dec., 1899.

Perithecium almost wholly free, pale amber-colored or straw-yellow, transparent, stout, the tip blunt, with blackish basal suffusions, well distinguished, especially on the inner side. Receptacle short and stout, pale amber-colored, normal in form. Insertion-cell broad, often not deeply blackened. The appendages consisting of an outer and an inner series of from four to six superposed cells which, through a twist of the insertion-cell, become lateral instead of antero-posterior in position; each cell of these series produces externally a single simple short branch usually three-celled, the two lower cells short and inflated, the upper longer tapering to a blunt apex. Perithecia 140–165 × 60–70 μ. Total length to tip of perithecium 310–350 μ, to insertion-cell about 170 μ. Appendages, longest 85 μ.

On *Cafius seminitens* Horn, and *C. canescens* Mäk, U. S. National Museum, Los Angeles, California. On *C. sericeus* Holme, Brit. Mus. No. 437, Great Britain. On *Cafius* sp., Brit. Mus. No. 425, "Europe," No. 395, Hong Kong; *C. bisulcatus* Sol., Chile, Paris Museum No. 174. On *Cafius* sp. Kittery Point, Maine; on *C. catenatus*, New South Wales, Sharp Collection, No. 1136. On elytra and legs.

Although entomologists appear to be somewhat doubtful whether the staphylinid genus *Cafius* should be separated from *Philonthus*, this cosmopolitan species of *Laboulbenia* does not seem to share any such uncertainty, as I have never seen it on any of the thousands of *Philonthi* that I have examined, while members of the genus *Cafius*, as above indicated, are subject to its parasitism all over the world. The species is well marked, being clearly distinguished by its appendages, the outer and inner eventually so displaced that they lie nearly side by side, and consisting each of a single series of somewhat obliquely superposed cells which give rise externally to simple single branches, somewhat as in appendages of the *Galerita*-type. The species is remarkably constant considering its very wide distribution, and is not nearly allied to any other described form.

Laboulbenia pallescens Thaxter. Plate LXI, figs. 9–10.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 318. July, 1905. *Laboulbenia pallida*. Thaxter, l. c., Vol. XXXVIII, p. 49, June, 1902: *nec L. pallida*, l. c., Vol. XXXV, p. 193. Dec. 1899.

Hyaline, becoming faintly suffused with yellowish brown. Perithecium one half or less free, concolorous or slightly darker, stout, erect; the tip small, usually well distinguished, bent outward; the lip-cells outwardly oblique, the inner much more prominent, rounded distally, wholly suffused, except the edges, with dark distinctly reddish brown. Receptacle normal, or often abnormally septate, more commonly as a result of one or two distal divisions of cell V. Insertion-cell broad, reddish brown, transparent but contrasting, irregular in form, often oblique in position, being carried out free from the base of the perithecium, from which it is separated by the partly free upper margin of cell V, sometimes once divided vertically; an external distinct similar accessory insertion-cell, bearing a single appendage and standing in direct relation to one of the subdivisions of cell V is rarely present. The appendages hyaline, in general normal, the outer basal cell twice or more than twice as large as the inner, bearing usually two branches which may be once branched, one of them sometimes an antheridial branch; the basal cell of the inner appendage producing usually a branch on either side, which may bear only short antheridial branchlets or longer simple sterile ones. Antheridia relatively large, stout, single or in pairs. Spores 75 × 6 μ. Perithecia 125–150 × 60–70 μ. Receptacle 220–300 μ. Longer appendages 150 μ. Total length to tip of perithecium 290–380 μ.

On elytron of *Clivina fasciata* Putz., St. Geronima, Guatemala; British Museum, No. 674. On *C. dilutipennis* Putz., Mexico; British Museum, No. 675.

This species is quite typical of the "*Clivinæ*" group, the abnormal divisions below the insertion cell being characteristic; although in some specimens the receptacle is absolutely normal. It is distinguished by its pale color and the peculiar red shade of its insertion-cell, which is but faintly suffused, the suffusion at the tip of the perithecium having the same peculiar pale red tinge. In fig. 10 an individual is represented in which an accessory insertion-cell is developed in connection with a cell distally separated from cell IV, which has the same reddish coloration.

Laboulbenia Clivinalis Thaxter. Plate LXI, figs. 5–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 165. Dec., 1899.

Usually rather slender. Perithecium three fourths or more free, more or less deeply tinged with blackish olive-brown, distally curved slightly outward, the tip black with hyaline lip-edges. Receptacle wholly hyaline, or cells III and IV becoming more or less suffused with blackish brown, the suffused areas punctate: bulging distally below the perithecium. Insertion-cell well differentiated, black. Appendages consisting of an inner and an outer basal cell, which may remain simple or become longitudinally divided, sometimes also transversely or even obliquely: the outer basal cell hyaline, often several times as long as broad, its distal septum blackened; when simple, bearing a single branch, if divided, several; the basal cell of the outer branch usually rather short and somewhat suffused, commonly bearing two branchlets. The basal cell of the inner appendage usually smaller than that of the outer, sometimes equal, and like it simple or divided; when simple, bearing a branch on either side, or more if it is divided. All the branches of both appendages hyaline or nearly so, mostly once branched above their basal cells. Spores about 55 × 4.5 μ. Perithecia 120–150 × 35–50 μ. Total length to tip of perithecium 275–400 μ; to insertion cell 200–340 μ. Appendages, longest 300–400 μ.

On *Clivina collaris* Herbst, Hope Coll. No. 348, and Brit. Mus. No. 456, both from England. On *Clivina fossor* Linn., Hope Coll. Nos. 353, 275 and 475, England; No. 295, "Europe"; Florence Mus., Italy; Berlin Mus., No. 886, on *C. fossor* Linn. Usually on elytra and superior prothorax, but occurring elsewhere.

The typical unmodified form of this species is represented in fig. 5, a British specimen, which is taken as the Type (B. M. No. 456); but the material examined shows very considerable variation similar to that which characterizes the "*Clivina*" group generally, and here usually manifests itself in abnormal divisions of cell IV, and of the basal cells of the appendages. Apart from other differences, the species is distinguished from others in this section by the black septum and suffusion which occur at the base of the outer branch of the outer appendage. It does not usually occur abundantly on a given host, but on the other hand does not appear to be uncommon. A form identical with this, or very closely allied was obtained on *C. Australasiæ* Boh., from Luzon, Philippines in the Berlin Museum No. 885.

Laboulbenia barbata Thaxter. Plate LXI, fig. 11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 160. Dec., 1899.

Perithecium large, pale yellowish or brownish becoming slightly tinged with amber-brown, often symmetrically inflated and tapering gradually to the tip, which is brownish below, becoming black on the inner side, the lips subhyaline, turned slightly outward. Receptacle concolorous with the perithecium, normal except that cell V is greatly enlarged and extends upward covering nearly one half of the inner margin of the perithecium, bulging strongly outward and carrying out the insertion-cell, which is thus made lateral in position. Insertion-cell externally concave or indented. The outer appendage consisting of a small roundish basal cell giving rise to two, rarely more, branches antero-posteriorly, which are usually once branched near the base, the branchlets very elongate, slender, attenuated, curved outward and downward: the inner appendage consisting of a similar basal cell from which arise usually two branches, one on either side, similar to those of the outer appendage, the whole forming a hanging beard-like tuft. Perithecia 190–200 × 55–60 μ. Total length to tip of perithecium, average 400 μ; to insertion-cell, average 190–200 μ. Appendages, longest 450–650 μ. Spores 100 × 6 μ.

On *Morio Georgiæ* Pal., Brit. Mus. No. 690 (Biologia Collection), El Zambador, Mexico; on *M. simplex*, Dej., Brit. Mus. No. 581, Cayenne; on *M. monilicornis*, Latr., Hope Collection, No. 289, "North America." On the elytra.

This very distinct species, which was found in one instance in company with *L. Morionis*, cannot be confused with any other known form: its pendent appendages and the monstrous development of cell V, as well as the form of its perithecium, serving clearly to distinguish it. The receptacle is usually somewhat shorter than is shown in fig. 11; but the material, which is sufficient and in good condition, shows no variations of importance. Although no tendency to an irregular division of the distal cells of the receptacle, or of the basal cells of the appendages, has been observed, this species seems as nearly allied to *L. pallescens* and to the small "*Clivinæ*" group as to any others, and is therefore included here.

Laboulbenia Polyhirmæ Thaxter. Plate LXV, fig. 1–3.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 195. Dec., 1899.

Perithecium rather slender, almost wholly free, nearly hyaline or faintly brownish yellow; tapering slightly toward the moderately well differentiated tip which is usually bent slightly outward, more or less blackened on the inner side, where it may form a hunch-like projection, sometimes wholly black, the inner lips often prominently rounded and terminal, sometimes subtended externally by a more or less well developed hunch. Receptacle concolorous with the perithecium, marked by faint transverse striations, long and slender; cell II usually greatly elongated; the distal portion small and normal, protruding more or less distinctly below the perithecium. Outer appendage consisting of a small basal cell more or less rounded and producing distally from two to four branches, usually four; an outer and an inner, the two others placed between them one on either side, the branches simple or usually not more than once branched above the basal cell; the branchlets slender, often flexed, rather closely septate, hardly tapering: the inner appendage consisting of a smaller rounded basal cell which produces on either side a single branch, which may branch several times and bears hyaline lateral or terminal antheridia singly or in pairs; all the branches nearly hyaline. Perithecia 130-190 × 30–40 μ. Total length to tip of perithecium 400–700 μ, average 500 μ, to insertion-cell 275–450 μ. Appendages, longest 350–400 μ. Greatest width 40–50 μ. Spores 35–45 × 4–4.5 μ.

On *Polyhirma* sp., Paris Museum, Nos. 5, 6, and 168, Tangar, Algeria. Berlin Mus. No. 1051 on *P. hamifera* Harold, Zanzibar. Sharp Coll. No. 1167 on *Polyhirma* sp., Lorenzo Marques, Africa. On inferior surface of abdomen and thorax, especially in depressions at base of posterior legs.

This species is subject to considerable variations the extremes of which are illustrated in figs. 1–3, the latter being the normal type-form from which the original description was drawn. This normal form, although it is not distinguished by any very striking peculiarities, does not seem nearly related to any of the known species. The normal arrangement of the branches of its outer appendages is unusual, cell IV is relatively small, not longer than cell V in general; the rest of the receptacle slender, the perithecium relatively small, as are the spores. Between this normal type and the variety represented in fig. 2, a complete series of intermediate conditions occurs. The variety represented in fig. 1, in which the general form is stouter and more compact, with a relatively larger perithecium, having a tip quite differently shaped, was found in company with the type and is certainly not to be separated from it. Its spores are larger (45 × 4.5 μ), however, than in the type, in which they hardly exceed 35 μ in length.

LABOULBENIA PAPUANA Thaxter. Plate LXI, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 193. Dec., 1899.

Perithecium nearly two thirds free, straight or curved slightly outward, the inner margin convex, pale brownish yellow, the tip rather well differentiated, blackish; the hyaline irregularly prominent lip-edges turned inward. Receptacle elongate, cell II, and cell I except at its base, conspicuously tinged with blackish and faintly transversely striate-punctate, the rest of the receptacle concolorous with the perithecium; cell IV externally concave, the whole receptacle more or less prominently bent anteriorly in the region of cells III and VI. Insertion-cell broad, horizontal, black, narrower than cells IV–V. The basal cells of the appendages simple and distinct, the outer producing a single branch which may branch once; the branchlets short; the basal cell of the inner appendage producing two small branches which may be once branched. Spores about 65 × 5.5 μ. Perithecium 160–200 × 55–65 μ. Total length to tip of perithecium 650–880 μ; to insertion-cell 544–700 μ. Appendages, longest seen, 140 μ.

On *Morio* sp., Paris Museum, No. 112, New Guinea. On anterior inferior surface of thorax on right side.

It is conceivable that this species might prove an extreme form of *L. Morionis* which occurs on the same host; but its horizontal insertion-cell, the peculiar modification of the apex of its perithecium, and the form and coloration of its receptacle, seem to distinguish it sufficiently.

LABOULBENIA MORIONIS Thaxter.

Although this species appears to be subject to considerable variation in form, size, color, and in the development of its appendages, it is, with the exception of a possible variety on *Morio orientalis* from Java below referred to, readily separable from the other species of the "*Clivinæ*" group, by the relation in position between its receptacle and peritheeium, only the tip of which is free above cell V. The specimens from the East are usually more deeply colored, and less yellowish, cell V often less prominent than in the American specimens. The appendages, though usually short or broken, as represented in my Monograph, are sometimes well developed, exceeding the perithecium in length, with variably developed basal cells. One form from the legs of *M. Braziliensis* (Berlin Museum No. 899) varies in its comparatively short stout habit, black brown suffusions, and elongate appendages (over 200 μ); but is associated with the normal type, and is merely a variation brought about by growth on the legs of its host. Two numbers (Paris 90 and Berlin 901) on *M. orientalis* from Java, vary distinctly from the type in that the insertion-cell is horizontally placed, and a third of the perithecium, more or less, is free above it. In these respects it is more nearly allied to *L. Papuana* in which more than half the perithecium is free, but the apex of the latter is quite different as is the general form and coloration of the receptacle.

Additional material has been examined from the following sources: British Museum: On *Morio Georgiæ* Pal., El Zambador, Mexico; No. 580 on *M. Braziliensis* Dej., Brazil; No. 579 on *Morio* sp., Nauta, Amazon; No. 691 on *Moriosomus sylvestris* Motsch., Mexico. Paris Museum No. 112 on *Morio* sp., New Guinea and No. 157 Java; No. 90, variety, on *M. orientalis* Dej., Java. Hope Collection; No. 291 on *M. monilicornis* Latr., Mexico; No. 293 on *Morio* sp., Brazil; No. 292 on *M. Braziliensis* Dej., Brazil. Berlin Museum; Nos. 899–900 on *M. Braziliensis* Dej., Rio de Janeiro; No. 898 on *M. simplex* Dej., Peru; No. 901, variety on *M. orientalis* Dej., Java.

Laboulbenia Dercyli Thaxter. Plate LXVI, figs. 2–3.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 171. Dec., 1899.

Perithecia free except at the base, short, stout, becoming tinged with brown, straight or the usually very broad tip turned slightly outward, the latter black, contrasting with the hyaline lip-edges. Receptacle elongate, faintly and uniformly tinged with smoky brown, normal, except that cell V is pushed up even beyond the hyaline unmodified insertion-cell which becomes thus external to it. Appendages typically consisting of an inner and an outer basal cell, the outer bearing a single oblique or nearly vertical more or less irregular row of branches arising antero-posteriorly; the inner bearing a similar row on either side, all the branches hyaline or yellowish brown, more or less copiously branched; the lower cells somewhat inflated, the septa blackened, often oblique, the basal cells of the branches bearing distally and externally from one to three obliquely superposed branchlets with blackened septa, which may branch again; the ultimate branchlets tapering slightly, the septa transverse and hyaline, usually appressed and coherent. A third group of branches similar to the rest sometimes arises between these and the perithecium, apparently from the distal portion of cell V. Perithecia 140–200 × 55–60 μ. Total length to tip of perithecium 475–875 μ; to insertion-cell 400–700 μ. Appendages, longest about 175 μ.

On *Dercylus tenebriosus* Laf. (= *Eurysoma tenebrioides*?), Hope Coll. No. 328, Para; Brit. Mus. No. 586, "S. America." On *Dercylus ater* Castel., Berlin Museum, No. 917. Para.

This form has been found on several specimens of *Dercylus* always along the margin of the right elytron. It is very doubtful whether it should properly be kept distinct from *L. variabilis*. The perithecium is more stout and blunt, the appendages are more closely septate and flexuous, and it does not show the same tendency to produce secondary appendiculate cells through proliferation of cells IV and V, that is so striking in the last mentioned species. Although it may well be nothing more than a variety, I have thought it best to retain the specific distinction until material can be examined in better condition than that available, in which even the youngest specimens do not show the character of the antheridia. That *L. Dercyli* is distinct from *L. gibbifera* on the same host where it grows in a different position, is also very doubtful.

LABOULBENIA GIBBIFERA Thaxter. Plate LXVI, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 179. Dec., 1899.

Perithecium free or nearly so, somewhat narrower than in *L. Dercyli*, the apex narrower and more abruptly distinguished, the lips distinct, turned slightly inward; an external outgrowth just below the blackened tip, which it may exceed in length, forming a free protuberance straight or bent sidewise or inward, its apex evenly rounded or slightly inflated, its outer margin continuous with the nearly straight margin of the perithecium. Cells I and II of the receptacle faintly punctate, relatively long and stout, nearly isodiametric; cell II about twice as long, distally nearly as broad as the portion of the receptacle above it comprising cells III and VI, which are about equal in length; the latter extending obliquely somewhat lower but little higher than the former, and much narrower; the region of cells II–V more deeply suffused and distinctly punctate with blackish brown points, the undifferentiated insertion-cell pushed out by the enlargement of cells IV and V. Appendages consisting of a number of prominently projecting basal cells, originating in part from the proliferation of cell V, which bear branches terminally and unilaterally, distinguished by blackened septa; the branches once to twice branched, their basal portion slightly suffused and with blackened oblique septa; the distal portion quite hyaline. Perithecium 150–167 × 50 μ. Total length to tip of perithecium 400–450 μ; to insertion-cell 275–340 μ. Appendages 150 μ.

On *Dercylus tenebriosus* Laf. (*Eurysoma tenebrioides*?), Hope Coll. No. 328, Para; Brit. Mus. No. 586, "S. America." Inferior surface of thorax and prothorax near base of two anterior pairs of legs.

Although this form is distinguished from *L. Dercyli*, with which it was associated on the same host, by the peculiar outgrowth from its perithecium, by the arrangement of the distal cells of its receptacle, and by the multiplication of its appendages through the proliferation of cell V, it may prove only a variety. The curious perithecial outgrowth, however, is certainly not a structure which develops at late maturity; since it appears well developed in the youngest perithecia; and in the sufficiently abundant material available of both species, there are no transitional conditions. It should nevertheless be pointed out that a similar outgrowth occurs in some specimens of the very variable *L. Polyhirmæ* (Plate LXV, figs. 1–3) but in this case a variety of intermediate conditions occurs. As in the case of *L. Dercyli*, the specific designation is provisionally retained and both may eventually have to be reduced to synonyms of *L. variabilis*.

LABOULBENIA VARIABILIS Thaxter.

This species appears to be absolutely confined to the western hemisphere, although it extends throughout the two continents. It is a very common and extremely variable form and occurs on a great variety of hosts. Through the courtesy of Dr. Horn of Berlin I have been able to examine specimens on two species on *Tetracha* from Ecuador, which differ in no essential respect from the typical forms, and are the first members of the family which have thus far been seen on any member of the Cicindelidæ. The variations of the species in general are associated with rather extreme variations in size and coloration and in the variable proliferation of the cells of the receptacle adjoining the insertion-cell which give rise to a variable number of appendiculate cells. The following is a partial list of the additional material of this species which has been examined since the publication of my Monograph.

British Museum, No. 628, on *Platysma caudicollis* Dej., Buenos Aires; No. 658 on *Pœcilus Mexicanus* Chd., Mexico; No. 584 on *Aspidoglossa* sp., Louisiana: Hope Collection No. 333 on *Pterostichus* sp., "New York"; No. 337 on an undetermined carabid from Valparaiso, Chile; Berlin Museum No. 868 on *Omophron Americanum* Dej., N. America; No. 914 on *Brachygnathus fulgidipennis* Guer., Brazil; No. 927 on *Chlænius Gundlachi* Chaud., Cuba. U. S. National Museum No. 21, on *Chlænius chlorochrous* Chaud., Central America; on *Tetracha Horni* Ruse, and *T. fulgida* Klg., Ecuador; received from Dr. W. Horn of Berlin.

LABOULBENIA MELANOPUS Thaxter. Plate LXVI, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 187. Dec., 1899.

Perithecium free except at the base, large, rather deeply suffused with smoky brown, translucent, not contrasting; the subdistal wall-cells lighter, tapering abruptly to the narrow somewhat incurved tip, the inner lip-cells, only, deeply blackened. Receptacle somewhat curved, tapering below to the short slender basal cell which is smoky black except at its base, the distal cells gradually suffused with yellowish brown. Insertion-cell unmodified, blackened externally, the basal cells of the outer appendage becoming blackened externally very broad and short, bearing distally a series of erect branches at first more or less double, but later multiplied to form a dense tuft covering the expanded upper surface of the cell; the basal cell of the inner appendage producing similar but smaller groups of branches on either side, the basal cells of all the branches becoming more or less inflated distally, and bearing terminally and subterminally several (six to ten) branchlets, each of which may become again branched, the branches and branchlets distinguished by blackened septa; the ultimate branchlets very slender flexuous hyaline, not extending to the tip of the perithecium in the types. Spores about 60 × 4.5 μ. Perithecium 290 × 70 μ. Total length to tip of perithecium 675 μ; to insertion-cell 400 μ. Appendages, longer 140 μ.

On a carabid (allied to *Harpalus ?*), at the tip of abdomen. Paris Mus. No. 115, Africa.

This very distinct species is most nearly allied to *L. variabilis* and *L. orientalis*, from which it is, however, so distinct that its numerous differences do not need to be pointed out. The material is unfortunately not abundant, and the mature individuals have their appendages more or less broken in all cases; but the manner in which they originate is clearly seen in fig. 5, a young individual in which neither the basal cells of the inner appendage nor of the branches have begun to proliferate.

LABOULBENIA GYRINIDARUM Thaxter.

The type of this species was figured (Plate XXII, fig. 31) in my Monograph, but a more careful reexamination of the material available shows that there are two species often associated on our American *Gyrini*. The type is distinguished by its smaller size, its straight, almost isodiametric, perithecium, which is furnished with short blunt projections as in the figure; and by the narrower insertion-region, and less abundant appendages: the wall-cells of the perithecium are straight, and the receptacle usually geniculate. The second form corresponds so closely to that which I have described as *L. chætophora*, of which a single example was found in the Sharp Collection on *Dineutes solitarius* from Madagascar (?) that I am unable to distinguish them specifically; and this species should therefore be added to the North American forms. It is the tip of the perithecium of this second form that is represented in fig. 37 of my Monograph, the projections from which are much longer and more sharply pointed, usually black and spine-like. The general form of the perithecium is conical, exactly as in *L. chætophora*, the wall-cells spirally twisted, the plant as a whole usually straight and subfusiform, the insertion-region much broader than in *L. Gyrinidarum*, and the appendages more numerous.

Several specimens in very poor condition have been obtained from British and Italian species of *Gyrinus* (British Museum No. 459 on *Gyrinus urinator* Illig., British Isles, and in the Florence Museum on *G. bicolor* Payk. and *G. striatus* Fabr., Italy, which have been referred provisionally to *L. Gyrinidarum*. It is uncertain, however, whether they properly belong to this species. Several poor specimens on *Gyrinus* from Mexico and from South America have also been examined, but here also the material is not sufficient to render a reliable determination possible, and their reference here is only provisional.

LABOULBENIA CHÆTOPHORA Thaxter. Plate LXVII, fig. 19.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 317. July, 1905.

Perithecium dirty olive brown, straight, subconical; the upper two-thirds free, tapering from a broad base, the wall-cells with a distinct spiral twist, very slightly enlarged below the tip, which is slightly, but rather abruptly, distinguished, symmetrical, black, except distally; the apex rounded, and bearing an erect shorter, and an externally divergent, much longer, straight, black-brown, spine-like process. Receptacle broad, distally tapering to a slender base; the basal and subbasal cells about equal in length, dirty yellowish; cells III and VI about equal in length, much darker; the cells above them almost opaque; bulging externally below the insertion-cells, which bear numerous short, rounded appendiculate cells, one or two of them larger and opaque; the branches numerous, the branchlets similar to those which in general characterize species of this section of the genus (mostly broken in the type). Perithecia 380 × 110 μ, the longer spine 40 μ. Receptacle 525 μ, or over. Total length to tip of perithecium 800 × 185 μ.

On the tip of abdomen of *Dineutes solitarius*, Madagascar (?); Sharp Collection, No. 1075. On North American species of *Gyrinus*.

Fig. 19 represents the type of this species from *Dineutes solitarius*. It is distinguished from other described species by its conical spinose perithecium, and straight subfusiform habit. As has been previously mentioned under *L. Gyrinidarum*, I have referred to this species a form found in various parts of North America on *Gyrinus*, sometimes associated with *L. Gyrinidarum* which, though not quite so large, appears to correspond in all essentials with the present species. The dissimilarity of the two American forms was first called to my attention by Professor Faull who had observed them in Canada, but it seemed to me at the time that they were no more than varieties, an error of which I have been convinced by a thorough reexamination of all the material available.

LABOULBENIA BICORNIS Thaxter. Plate LXVII, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 160. Dec., 1899.

Perithecium wholly free, dark brown tinged with olive, becoming opaque, lighter at the base; very elongate, nearly straight, slightly and gradually inflated from the neck-like base to about the middle, thence tapering very slightly to the tip, which is distinctly though not abruptly differentiated: the two inner lip-cells symmetrical, each terminating in a small rounded prominence which bears a second smaller rounded terminal prominence; from the base of the lower prominence a long slender brown or olive-brown horn-like process grows downward, inward, and upward, the two symmetrical and similar and resembling the horns of an ox; though formed from the *inner* lip-cells, a slight twist in the wall-cells usually makes them appear lateral or even external. The two outer lip-cells grow beyond the inner and are closely united forming a large bluntly pointed nose-like projection, its inner margin slightly convex, while externally it is nearly straight and slightly oblique. Receptacle short and stout, evenly dark olive-brown; cell I short, slender; cell II abruptly larger, broad and short. The basal cells of the appendages opaque and indistinguishable, giving rise, as in allied aquatic species, to cladophorous prominences, the branches once or twice branched, hyaline, the lower three or four septa dark, the cells between them slightly inflated, the distal portion elongate, cylindrical, thin-walled, blunt-tipped, without dark septa, the whole forming a dense tuft. Spores 125–140 × 7–8 μ. Perithecia 340–750 × 60–75 μ. Total length to tip of perithecium, longest 1150 μ; to insertion-cell 340–400 μ; greatest width 120–130 μ.

On *Dineutes æreus* Klug., Brit. Mus. No. 461, Hadramant, Arabia; on *Dineutes* sp., Brit. Mus. No. 463, Ambaca, Angola, W. Africa. On abdomen, elytra, thorax, and head.

This large species is one of the most striking that has thus far been discovered in this genus, and cannot be confused with any other described form. The peculiar conformation of the tip with its remarkable appendages is quite unique and has the appearance of a cow's head (fig. 2).

LABOULBENIA AQUATICA Thaxter. Plate LXVI, figs. 18–19.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 158. Dec., 1899.

Perithecium free nearly to its base, rather short and stout becoming dark olive-brown, the wall-cells very slightly twisted, the blackened tip well differentiated; nearly symmetrical, subtruncate, the lip-edges hyaline, the lip "valves" prominent. Receptacle rather short and distally broad, olivaceous, lighter below. Insertion-cell unmodified, external, about as large as and nearly symmetrical with cell V, the two lying side by side above cell IV. The appendages consisting of an outer basal cell from which is formed a primary dark brown terminal prominence bearing several small branches distally, while about its base externally, and often on only one side, several secondary unmodified prominences arise, each producing usually a single terminal branch. The inner basal cell moderately distinct, at first simple, later apparently divided or lobed and bearing several branches. All the branches hyaline, constricted at the lower (four to about six) dark, mostly oblique septa; the distal portion slender, elongate, subrigid, tapering, without constrictions or colored septa, the basal segments bearing numerous typical flask-shaped antheridia. Spores 70 × 4.5 μ. Perithecia, average 100 × 38 μ. Total length to tip of perithecium average 220 μ; to insertion-cell 150 μ; greatest width 30 μ. Appendages, longest 175 μ.

On *Gyretes* ? sp., Paris Museum, No. 106, Venezuela. On elytra.

Abundant material of this species has been examined, and it appears to be very constant in its characters. The perithecium lacks entirely the peculiar modifications that distinguish nearly all the other members of this aquatic section of the genus, and corresponds in form, structure and appearance to that of the most typical "terrestrial" species. While the appendages, both in their general character and method of origin in connection with a sterile elevation, correspond to the conditions seen in the more pronounced aquatic types, it is the only one of these thus far examined in which typical single flask-shaped antheridia are readily recognizable and abundantly developed (fig. 19). In fact I have as yet been unable to satisfy myself concerning the antherida in any other aquatic species, a fact which may in part be due to the poor condition in which these forms are usually obtained.

LABOULBENIA CUBENSIS Thaxter. Plate LXVI, figs. 11–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 169. Dec., 1899.

Perithecium short and stout, free except at the base, slightly curved toward the appendages, blackish olive, the lip-cells prominent but flattened backward and outward. Receptacle elongate, cells I and II dirty olive, cell III hyaline, long, contrasting with cells IV and V, which, together with the basal cells of the perithecium, are deeply suffused with blackish olive; cell VI as long as cell III and lying beside it, becoming tinged with dirty olive; basal cells of appendages dark olive, indistinguishable, producing concolorous prominences which give rise to a number of hyaline branches, the basal cells of which are large, swollen distally, and bear numerous terminal and subterminal branchlets externally; the branchlets once or twice branched, the septa olive. Perithecia 155–190 × 75–85 μ. Total length to tip of perithecium 480–800 μ. Appendages, longest 140 μ.

Tip of abdomen of *Dineutes longimanus* Oliv., Paris Museum, No. 101, Cuba.

This species, of which only three specimens have been examined is distinguished by the ear-like modification of the lip-cells (fig. 12) and the numerous appendiculate upgrowths from the insertion region. It has no close allies in this section, though perhaps as nearly related to *L. constricta* as to any other species.

LABOULBENIA CONSTRICTA Thaxter. Plate LXVI, figs. 16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 167. Dec., 1899.

Perithecium more than one half free, short, stout, inflated, somewhat olive-brown, the tip not differentiated, one of the lip-edges becoming modified to form a flattish or roundish brown prominence which lies usually in a median position between two rather ill defined prominences on either side of it. Receptacle usually with a double curvature, its basal cell very large, somewhat inflated distally, the base and posterior margin paler, cell II shorter, suffused below, strongly constricted distally, the constricted portion paler or hyaline: the distal portion of the receptacle short, deeply suffused, bulging strongly anteriorly below the insertion of the appendages. Insertion-cell not blackened, the appendages arising much as in *L. Orectochili* and *L. strangulata*, the branches hyaline, the basal portion closely septate, simple, without persistent blackened basal portions. Spores 70 × 6 μ. Perithecia, average 130 × 60 μ. Total length to tip of perithecium, average 400 μ; to insertion-cell 340 μ. Appendages 70 μ (or more ?).

On *Orectogyrus glaucus* Klug., Brit. Mus. No. 465, Cape Coast Castle, Africa. On elytra.

This form is distinguished by the usually very marked inflation of its large basal cell, and the constriction of its subbasal cell, which forms a slender neck below the distal portion of the receptacle. The latter is unusually prominent below the insertion-region, though not developed in the abnormal fashion seen in *L. anomala*, which is perhaps its nearest ally. The material examined is not abundant, or in good condition, but, as far as can be determined, the characters are constant.

Laboulbenia anomala Thaxter. Plate LXVI, figs. 14–15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 157. Dec., 1899.

Perithecia nearly symmetrical, free except at the base, tapering distally, the tip somewhat lighter, subtruncate, with one (or more ?) of the lip-edges modified to form a prominent large somewhat irregular blackish brown median projection, which causes the tip to appear notched on the inner side. Receptacle dirty olive-brown, finely punctate, the whole curved almost to a horseshoe form: cells I and II about equal in length and diameter, the base of the perithecium opposite cell III, insertion-cell unmodified external subtriangular, cell V similar to it, about twice as large and occupying a corresponding position on the inner side; the two together with the terminal portion of cell IV, on either side of which they lie, form the free broadly clavate terminal portion of the receptacle above the narrower and also wholly free basal half or more of cell IV. Basal cells of appendages not distinguishable, giving rise to a number of prominences (about twelve) each forming the base of a branch, the branches simple or rarely branched, hyaline, of two kinds, the one with long slightly inflated basal cells, the other closely septate, intermediate forms occurring in which the septa are more remote; all the septa brownish purple. Perithecia 140 × 40 μ. Total length to tip of perithecium about 450 μ; to tip of free end of receptacle 450 μ. Appendages 140–160 μ.

On elytra of *Orectogyrus suturalis* Reg., Paris, No. 102, Zambesi River, Africa; of *O. glaucus* Klug. Brit. Mus. No. 465, Cape Coast Castle, Africa.

This species, of which only scanty material has been examined, is distinguished by its contorted form and the anomalous development of the distal part of the receptacle, the insertion-region being carried up and out free, even beyond the tip of the perithecium. Though similar in some respects to *L. constricta*, it seems abundantly distinguished from this species.

Laboulbenia dactylophora Thaxter. Plate LXVII, figs. 3–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 169. Dec., 1899.

Perithecium relatively small, its upper third, only, free from the receptacle, translucent smoky brown, the tip prominent, not abruptly differentiated, its upper half hyaline, relatively large and broad, subtruncate or irregularly sulcate, the lower half blackened, the lips black-tipped, somewhat spreading. Receptacle very elongate, concolorous with the perithecium or paler, finely punctate, tapering below, its curved base hyaline, the basal cell expanding distally to the very broad upper septum, which forms the middle of a somewhat one-sided enlargement involving the adjacent extremities of cells I and II, cell II more distinctly punctate, very long, tapering very slightly nearly to its distal extremity, cell V producing two outgrowths, one on either side, erect, usually similar, brown, distally somewhat enlarged, the rounded tips often bent slightly outward, extending to or beyond the tip of the perithecium. Appendages consisting of two (or more ?) basal cells from which several protrusions arise bearing groups of branches which are several times branched, forming a dense tuft not as long as the outgrowths from cell V, the lower septa brown or blackish, between the short cells. Perithecia 170–190 × 48–50 μ. Total length to tip of perithecium 750–880 μ; to insertion-cell 680–810 μ; cell II about 425 μ long. Outgrowths from cell V, 58 μ. Appendages 50 μ.

On *Orectogyrus specularis* Aube, Paris Museum, No. 100, Gold Coast, W. Africa: on *O. ornaticollis* Aube, Sharp Coll. No. 1084, Madagascar: also Berlin Museum No. 806, "Africa." Margin of elytra.

Specimens of this species from Madagascar, of which six have been examined, all differ from the type form from Africa (fig. 4, Paris Museum) in that the paired finger-like projections, associated with the appendages are much shorter, while the receptacle lacks the characteristic geniculate habit above cell I, which occurs in all the other specimens. The species is nevertheless very well distinguished, and cannot be confused with any other at present known. The figure of the type (Fig. 4) does not show the deeper suffusion of the paired outgrowths, or of the perithecium and the distal part of the receptacle.

Laboulbenia Guerinii Robin.

Sufficiently abundant material of this species has been examined from a variety of localities including specimens on *Gyretes sericeus* in the Paris Museum collected in Venezuela, if I recollect aright, by Guérin-Meneville, from whom the original material of *L. Guerinii* was obtained, so that there can be no doubt as to the accuracy of my former reference of the North American forms on *Gyretes* to this species, despite the fact that, as in the case of *L. Rougetii* the plant does not agree in all particulars with Robin's account and figures. The species is in general constant in its characters, the most striking departure from the usual form occurring in the specimens of *G. cinctus* in the Berlin Museum, the locality of which, Rio Janeiro, was doubtful, according to my memoranda. These specimens vary from the type in the considerable elongation of cell II, which is quite hyaline and contrasts with a deep brown distal suffusion of cell I.

Specimens have been examined from the following sources: Hope Collection: No. 227 on *Gyretes* sp., Mexico: No. 228 on *G. cinctus* Germ., Brazil. Paris Museum: No. 105 on *Gyretes* sp., Arauca, Venezuela; Nos. 97 and 104 on *G. sericeus* Lab., "S. America" and Venezuela; No. 107 on *G. cinctus* Germ., Brazil. British Museum: No. 468 on *G. pulverulentus* Sharp, Columbia; No. 771 on *G. acutangulus* Sharp, Bugaba, Panama; No. 770 on *G. proximus* Sharp, Costa Rica; No. 769 on *G. Guatemalensis* Reg., Paso Antonio, Guatemala; No. 767 on *G. minor* Reg., Torola, Mexico ?; on *G. Boreandri* Chev. Mexico. Sharp Collection: No. 1080 on *G. leionatus* Duby, Mexico; No. 1078 on *G. sericeus* Lab., Caraccas, Venezuela, U. S. National Museum; on *Gyretes* sp., Texas. Berlin Museum: No. 800 on *G. cinctus* Germ., Rio Janeiro ?; No. 801 on *G. dorsalis* Brullé, Brazil; No. 802 on *G. immarginatus*, Mexico; No. 803 on *G. pruinosus* Sharp, Columbia.

Laboulbenia drepanalis Thaxter. Plate LXVII, figs. 5–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 173. Dec., 1899.

Perithecium smoky olive, the inner half or less usually much paler, the upper three fourths free, falcate; the inner margin concave, the tip undifferentiated, the lip-edges forming a small hyaline rounded abruptly distinguished papilla. Receptacle rather short, concolorous with perithecium; cell I paler or hyaline with a basal blackish suffusion; cell V large, growing upward above the oblique insertion-cell which is thus pushed out free from the perithecium together with the basal cells of the appendages. Insertion-cell small, unmodified. Basal cells of the appendages closely united, and finally indistinguishable from one another, forming a prominent rounded outgrowth which gives rise to about six or eight branches, their dark basal septa of variable diameter only remaining, as a rule; the basal cells of the branches are distally inflated, and bear several branchlets externally and terminally, the basal cells of the branchlets mostly similar to those of the primary branches and similarly branched, the ultimate branchlets closely septate, the septa dark. Perithecia, Panama specimens 100 × 40 μ, Amazon 140 × 35 μ. Total length to tip of perithecium, Panama 210 μ, Amazon 275 μ; to insertion-cell, Panama 130 μ, Amazon 140 μ.

On *Gyretes acutangulus*, Sharp, Brit. Mus. No. 771 (Biologia Coll.), Bugaba, Panama; on *Gyretes* sp., Brit. Mus. No. 477, Amazon. On mid-elytron.

This species is distinguished from others of the same section by its falcate perithecium and small prominent insertion region. Specimens from Panama differ from the Amazon material, which is taken as the type (fig. 5), in their smaller size and darker color; but are not otherwise essentially distinguished. As in so many of the aquatic forms, the appendages are either badly broken or wholly wanting in the specimens examined.

Laboulbenia heterocheila Thaxter. Plate LXIV, fig. 16.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 179. Dec., 1899.

Perithecium olive-brown, united to cell IV nearly to its base, rather short, inflated below, tapering distally, the tip not abruptly differentiated, blackened below, the four lip-cells all differently modified: of the two inner lips one produces an erect rather slender brown finger-like terminal outgrowth, the other a shorter much broader paler outgrowth, turned inward nearly at right angles: of the two outer lips one forms merely a rounded prominence, while the other grows out into a large prominent brown blunt-tipped tooth-like projection, which becomes bent slightly outward and sideways. Receptacle rather long and slender, suffused with brown, the darker distal portion marked by fine transverse indistinct striations. The basal cells of the appendages more or less indistinguishable and giving rise to indistinct prominences bearing numerous branches, the basal cells of which are short, inflated distally, and bear a terminal and external series of closely septate branchlets; the latter once or twice branched, the septa dark, the whole forming a dense tuft about half as long as the perithecium. Spores 60 × 6 μ. Perithecium 200 × 70 μ. Total length to tip of perithecium 550 μ; to insertion-cell 400 μ. Longest lip-prominence 35 μ.

On the elytra of *Macrogyrus* sp., Brit. Mus. No. 486, and on *Macrogyrus obliquatus* Aube, Sharp Collection No. 1088, Timor, E. Indies.

The type of this species has unfortunately been so injured that it is not possible to make a drawing of the specimen. The tip of its perithecium, however, which is its most distinctive feature is represented in Fig. 16. The host was given in the original description as *Dineutes* sp. with a query, but it seems probable that it is in reality a species of *Macrogyrus*. The form obtained from the Sharp collection on this genus is not in good condition, nor are the peculiar perithecial outgrowths as well developed. A figure of one of these specimens will be given in a subsequent contribution, unless more typical material can be obtained.

Laboulbenia Dineutis Thaxter. Plate LXVII, figs. 17–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 171. Dec., 1899.

Perithecium free except at the base, dark brown, the inner margin straight, the outer curved from the base to the tip, which is not well differentiated, the lip-cells inconspicuously modified to form an inner tooth-like brown prominence curved inward, and a median small brown rounded elevation, which is covered by an outer hyaline externally brown broad irregular elevation. Receptacle elongate or rather short, dark brown, inconspicuously punctate. Appendages arising from a number of basal cells one of which, lying somewhat at the right, is more or less conspicuously prominent and more deeply suffused; the basal cells of the branches somewhat inflated distally, and bearing several branchlets, which may in turn be branched; the lower portion of the branches made up of short cells with contrasting black septa; the distal portions, when unbroken, slender hyaline elongate, without dark septa, much longer than the basal portion. Perithecium (Ceylon) 275 × 72 μ, (India) 140 × 40 μ. Total length to tip of perithecium, (Ceylon) 1 mm., (India) 400 μ, (Madagascar) 350 μ. Appendages, (Ceylon) 200 μ. Spores, (Ceylon) 75 × 6 μ.

On *Dineutes subspinosus* Klug., Paris, Nos. 33 and 34, Madagascar and Isle de France; Hope Collection, No. 236, no locality. On *Dineutes* spp., Hope Collection, Nos. 230, 231, 232, and 235, Bengal, Pondicherry (India), Ceylon, Mauritius. On *Dineutes*, Brit. Mus. No. 483, Nilgiri Hills, India. Berlin Museum No. 808b on *D. subspinosus*, Klg., Pondicherry and No. 808, Isle de France, No. 809 on *D. Indicus*, India. On margin of elytra and tip of abdomen.

This apparently common species is one of the least well defined members of this section. The tip of the perithecium varies but slightly in the conformation and coloration of the projections at its apex. A few specimens show slender hyaline filaments arising distally from the appendages, but in most cases the latter are not in good condition. As will be seen from the above measurements, the species appears to be subject to great variation in size. It is most nearly related to *L. heterocheila* and to *L. denticulata* which may prove to be a mere variety.

Laboulbenia denticulata Thaxter. Plate LXVII, figs. 7–9 and 12–13.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 170. Dec., 1899.

Perithecium free, olivaceous with blackish shades below the paler tip, rather narrow, straight; the tip broad, one of the inner lip-cells forming a short brown conical terminal prominence which is straight or bent toward the pore contrasting with the nearly colorless lip-edges below it. Receptacle pale brown or dirty olivaceous, elongate, normal. The insertion-cell nearly horizontal external to cell V, unmodified. The outer basal cell of the appendages giving rise to a single subconical brown prominence bearing branches terminally and externally and protruding beyond the inner basal cell, which is indistinguishable from the very numerous branches arising from it in all directions; all the branches hyaline, their basal cells bearing distally several branchlets which may again be branched, the four to eight lower septa dark. Perithecia, average 175 × 44 μ; the spine-like apex 10–12 μ. Total length to tip of perithecium 400–575 μ; to insertion-cell 275–400 μ; greatest width 55–70 μ. Appendages about 70 μ.

On *Dineutes*?, Brit. Mus. No. 482, Adelaide River, Australia.

A comparison of this Australian form with more abundant material of *L. Dineutis*, makes it appear very doubtful whether the two should be kept distinct, and their separation must be considered merely provisional. I have included under this name the form on *Macrogyrus elongatus*, represented in fig. 12–13, from New Guinea (Sharp Collection No. 1089) in which the conformation at the tip of the perithecium is even more unlike that of the typical *L. Dineutis* (fig. 18), and the appendages are very copiously developed. Yet it is hardly possible without examining more abundant material of all these forms to determine their relationships satisfactorily.

LABOULBENIA FALLAX Thaxter. Plate, LXVII, figs. 14–15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 176. Dec., 1899.

Perithecium becoming dark dirty olive-brown; the tip blackened, bent outward, the lips hyaline. Receptacle becoming concolorous with the perithecium except the hyaline slender basal cell, the remaining cells usually short and stout except cell V, which extends up along the inner margin of the perithecium nearly to its tip, its inner margin continuing the curvature of the tip down to the insertion of the appendages, so that the perithecium seems at first sight twice its actual size. Insertion-cell unmodified, forming a slight rounded external prominence within which the basal cells of the appendages form an evenly curved base from which arises a single antero-posterior row of branches about twelve in number, their lower cells slightly inflated, hyaline with dark septa, usually twice branched; the ultimate branchlets above the third or fourth septum slender without dark septa, scarcely exceeding the tip of the perithecium. Perithecium 100–120 × 35–40 μ. Total length to tip of perithecium 190–325 μ; to insertion-cell 120–250 μ. Greatest width 85 μ. Appendages 50 μ. (The larger measurements are from the Amazon specimens.)

On *Gyretes acutangulus* Sharp, Brit. Mus. No. 771 (Biologia Coll.), Bugaba, Panama; on *Gyretes* sp., Brit. Mus. No. 477, Amazon River; on *Gyretes* sp., Hope Coll. No. 229, Rio de Janeiro. At tips of elytra.

This species is very clearly distinguished, both from the monstrous development of cell V, and from the crest-like insertion of its appendages. The material is very scanty from all of the localities above mentioned, but there seems to be no considerable variation except in size and depth of suffusion, the latter, which involves the perithecium and the distal portion of the receptacle in most instances, is not shown in fig. 14. In several specimens there are two, or even three, external blackish elevations below the tip of the perithecium, which look like the base of old trichogynes, and in one young specimen two trichogynes seem actually to have been formed one above the other.

LABOULBENIA ROTUNDATA Thaxter. Plate LXVII, fig. 16.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 317. July, 1905.

Perithecium deep brown, except below the tip; broadly rounded, the inner margin of the upper half free above the insertion-cells, and formed by a single long cell extending to the tip, somewhat as in *L. fallax*, and perhaps representing a marginal extension of the receptacle, as in that species. The tip blunt, with two minute inner tooth-like prominences of unequal size, the larger subtended by a narrow black suffusion, the whole tip more deeply suffused externally. Receptacle straight, elongate, tapering throughout to the base, the basal cell more deeply suffused distally, and protruding somewhat anteriorly below the subbasal cell, which is pale dirty yellowish-brown, inconspicuously granular-punctate: the distal portion dark dirty brown, the cell-boundaries hardly visible. The insertion cells small, giving rise to numerous (a dozen or more, for the most part broken in the type) primary slender elavate cells, from which closely septate short branchlets arise externally. Perithecium 185 × 65 μ, not including the marginal cell, which is 18 μ broad. Receptacle 360 μ. Appendages (broken) about 50 μ. Total length to tip of perithecium 450 μ.

On *Dineutes spinosus*, Fabr., Java; Sharp Collection, No. 1086.

A single specimen, only, of this species has been examined, which is so deeply suffused that it is not possible to determine with certainty whether the peculiar cell which extends from the insertion region to the tip of the perithecium should be regarded as a prolongation of cell V, as it manifestly is in *L. fallax*, or as an abnormally developed wall-cell of the perithecium itself. It is so closely associated with the extreme tip of the perithecium that I am rather inclined to the latter view, but it will be necessary to see younger individuals before this can be determined. The species is not likely to be confounded with any other in this group by reason of the rounded form of its broad perithecium.

LABOULBENIA ORECTOCHILI Thaxter. Plate LXVII, figs. 10–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 191. Dec., 1899.

Perithecium free except at the base, more or less evenly suffused with smoky brown, with a subterminal external blackish patch, nearly symmetrical and straight, slightly inflated, tapering gradually to the hyaline tip which is surmounted by a median straight pointed purplish tooth-like projection, formed by the outgrowth of one of the lip-cells; the inner lip-cells forming a small hyaline or partly purplish lateral papilla. Receptacle elongate, cells I and II stout, the latter slightly if at all narrower distally, cells IV and V and the basal cells of the perithecium darker brown, the rest very pale yellowish or purplish brown, finely punctate, the dots scarcely visible except in the more deeply suffused areas. The insertion-cell broad, blackened, extending completely across the distal margins of cells IV and V. Appendages consisting of an inner and outer basal cell, giving rise in all to from five to ten erect subconical prominences, each of which becomes separated as the basal cell of a very short two-celled branch of which only a blackened basal portion remains in mature specimens, the rounded purplish slightly inflated terminal portion of the upper cell usually breaking off above its blackened slightly constricted basal half. Of the branches, that borne by the protuberance first formed from the outer basal cell, is always somewhat larger and more prominent than the rest. Perithecia 190 × 59 μ. Total length to tip of perithecium 475–680 μ; to insertion-cell 400–550 μ.

On *Orectochilus cordatus* Reg., Paris No. 99, "Asia." On elytra. Berlin Mus. No. 805, on *O. semivestitus* Guér., Siam. Sharp Coll. No. 1081 var. on *O. oblongiusculus* Reg., "Pedong."

This, together with the two succeeding species, form a well marked group in this section of the genus owing to the normal differentiation of the insertion-cell and the production of a variable number of basal cells, each of which bears but a single appendage, distinguished by a broad black septum. In the type form the appendages are more numerous (fig. 11, on *O. cordatus*), and the color darker. The extreme of variation, so far as it has been observed, is illustrated by fig. 10, on *O. oblongiusculus*, where but two basal cells are developed, and a slight difference in the projections from the tip of the perithecium is observable. The species is most nearly allied to *L. strangulata*, from which, as well as from *L. coarctata*, it is at once separated by the perithecial projections.

LABOULBENIA STRANGULATA Thaxter. Plate LXVI, fig. 20.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 202. Dec., 1899.

Perithecium one third to one half free, dark brown, concolorous below with the distally almost opaque receptacle; symmetrical, straight; the tip undifferentiated, bluntly rounded except for a hyaline flattish terminal papilla formed by the projection of one of the external lip-cells. Receptacle slender, cell I usually basally curved, broader at the distal end where it is rather deeply suffused with brown; cell II much longer, its lower two thirds often distinctly inflated, deep brown distally, rather abruptly constricted to less than half its greatest diameter, the constricted portion hyaline, the short remaining portion above the constriction becoming deep brown, concolorous with the upper portion of the receptacle. Insertion-cell normal, oblique, often concave above, the appendages consisting of an outer and an inner basal cell, the two producing in all from three to six outgrowths, hyaline, except the first one formed from the outer basal cell which is always external to those subsequently formed and is often divergent, deep brown or opaque, the suffusion involving the basal cell which bears it: each branch consists of a single simple cylindrical cell the distal portion of which is usually broken off, leaving the deep brown contrasting base. Spores 60 × 4.5 μ. Perithecium 120–140 × 40–45 μ; to insertion-cell, average 275 μ. Appendages 100 μ.

On *Orectochilus* ?, Brit. Mus. Nos. 480 and 484, Timor, East Indies. Margin of elytra. On *O. discifer* Walk., Sharp Coll. No. 1079, Nilghiri, India. No. 1076 and No. 1082, "Kodeicanel" Mts., Ind. Orient.

This species possesses a strangulate habit somewhat similar to that of *L. constricta*; but is otherwise quite different, being most nearly allied to *L. coarctata*. The small protruding lip-cells vary somewhat in their conformation, sometimes merely papillate, sometimes slightly spreading, subtended on the inner side by a blackish suffusion which is more or less conspicuous. Fig. 20 represents one of the specimens from Timor which are regarded as the type forms.

LABOULBENIA COARCTATA Thaxter. Plate LXVI, fig. 17.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 165. Dec., 1899.

Perithecium short and stout, dark brown and opaque, its upper half free, its contour evenly rounded, the small papillate translucent tip turned slightly inward and abruptly differentiated, the lips well defined. Receptacle dirty brown finely and obscurely punctate, of the typical form, lighter below, short, stout, cell I much narrowed below, cell II very broad, slightly inflated. Insertion-cell normally differentiated, broad and black. Basal cells of appendages well developed bearing about eight erect short stout simple branches with broad basal constricted blackened septa, their rounded tips slightly exceeding the tip of the perithecium. Spores 70 × 7 μ. Perithecia 140–170 × 62 μ. Total length to tip of perithecium 325–400 μ; to insertion-cell 250–300 μ; greatest width 100 μ.

On *Orectochilus* ?, Hope Coll. Nos. 233 and 234; Brit. Mus. No. 466, Bengal, India. Along median depression of elytra.

This species, which was found on several specimens growing along a groove of the elytra, is most nearly related to *L. strangulata*, but is abundantly distinct in a variety of ways. The material is in unusually good condition and abundant, and the characters appear to be very constant. Although the determination of the host is doubtful, there can be little chance of confusion in the case of so well defined a species.

RHACHOMYCES Thaxter. I. p. 358

This type proves to be a very constant one and the species, which are rather numerous, are found in all parts of the world on Carabidæ and Staphylinidæ. The main axis, as has been previously pointed out, is a proliferous branch arising from the subbasal cell of a two-celled appendiculate primary receptacle. The variations in the development of this secondary axis are very remarkable and the most highly developed forms are very striking in appearance.

In the more elongate species there are certain curious appearances on the cells of the main axis which strongly suggest the stigmata of lepidopterous and other insect larvæ. These appearances which are shown in the accompanying figures of *R. Philonthinus* and *R. Dolicaontis*, Plate XLIV, figs. 3–4 and 8, occur three on each cell as a rule, two lateral and one anterior. They do not appear to occur on the short forms, and it seems possible that they may act as valves to relieve the tension caused by sudden and abrupt flexion to which such individuals must often be subject. A structure somewhat similar in appearance has been described in connection with the perithecium of *Laboulbenia* (Monograph, Plate II, fig. 14, *x*).

RHACHOMYCES CANARIENSIS Thaxter. Plate XLIV, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 436. April, 1900.

Perithecium pale straw-colored, nearly straight, a median and subterminal well-defined broadly-rounded ridge marking the transverse septa between the three lower tiers of wall-cells; the tip tapering rather abruptly, hyaline, the apex rounded. Receptacle rather slender, the basal and subbasal cells relatively large, hyaline, the rest pale straw-colored, the main axis consisting of fifteen or sixteen cells, the upper five or six forming a free erect termination. The appendages not numerous, appressed, brown; those about the base of the perithecium larger, distally blunt and hyaline, about two thirds as long as the perithecium. Perithecia 90–130 × 27–30 μ. Receptacle 175–225 μ. Appendages, longest, about 100 μ. Total length to tip of perithecium 250–325 μ.

On the elytra of *Trechus flavomarginatus* Woll., British Museum, No. 419. Teneriffe: Paris Museum No. 184, on *Trechus Asturiensis* Le Br., Grotte de Puerto de Paganes, Asturias. Berlin Museum on *T. rotundipennis* Duft., "Gastein."

This small species, specimens of which from Teneriffe, fig. 1, and the single specimen from "Gastein," are illustrated in the accompanying plate, is well distinguished by the pale color of its appendages, the very prominent antheridia, and the two successive ridges which are present in the perithecium. It appears to be rare, and only one or two specimens were found on each of the hosts above referred to.

RHACHOMYCES THALPII Thaxter. Plate XLV, figs. 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 436. April, 1900.

Perithecium hyaline or straw-colored, becoming faintly tinged with brown, slender, inflated near the base; the distal half or less mostly curved away from the appendages, tapering gradually to the blunt undifferentiated apex. Receptacle normally consisting of eleven cells superposed to form the main axis, hyaline, their septa horizontal or but slightly oblique, the basal cell subtriangular, tinged with reddish brown; the cells of the secondary series hyaline and proportionately rather large. Appendages rather dense, almost opaque except the nearly or quite hyaline tip and inner margin; rather short, about four to six of those about the base of the perithecium much larger, longer, and stouter, reaching somewhat higher than the middle of the perithecium, their tips at first clavate becoming obliquely truncate or fan-shaped through the degeneration of the hyaline portion, the curved tips of the antheridia projecting rather conspicuously. Perithecia 115–30 μ. Total length of receptacle 140 μ. Longer appendages 90 μ.

On *Thalpius rufulus* Lec., U. S. National Museum, Texas.

This species is very closely related to *R. Zufii* from which it seems constantly to differ in its smaller size and differently shaped curved perithecium, the distal portion of which, even in young specimens, is free above the longest appendages. The appendages about the base of the perithecium are in both species characteristically spathulate-tipped, this type being larger, longer and more numerous in *R. Zufii* and extending down the axis to the base.

RHACHOMYCES ZUPHII Thaxter. Plate XLV, figs. 10–11.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 436. April, 1900.

Perithecium relatively small, straw-colored, somewhat inflated at the base, the tip rather abruptly distinguished and slightly inflated. Axis of the receptacle slender, consisting normally of about sixteen cells which are nearly hyaline, or with brown shades below the septa. Appendages nearly opaque, straight stout appressed, not elongate, more or less swollen distally along the inner margin of the subhyaline tip; eight to ten about the base of the perithecium longer and stouter. Perithecia 110–140 × 25 μ. Longer appendages about 110–140 μ. Total length to tip of perithecium 350–400 μ.

On *Zuphium Mexicanum* Chaud., British Museum (Biologia Coll.), No. 713. Cordova, Mexico.

Closely allied to *R. Thalpii*, but larger, with longer and more numerous appendages which nearly conceal the perithecium. The septa of the axis are usually more or less deeply suffused. In one specimen these suffusions above form black bands, but the region is not visible in a majority of the specimens, being hidden by the appendages.

RHACHOMYCES PILOSELLUS (Robin) Thaxter.

Scanty material of this species in poor condition was found in the Paris Collection, No. 176 on *Lathorbium fulvipenne* Fab. from France, and also on the same host var. *apteraum* in the Berlin collection from Europe. The specimens appear to correspond in all respects with those previously examined.

RHACHOMYCES APHÆNOPSIS Thaxter. Plate XLV, figs. 12–14.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 314. July, 1905.

Perithecium but slightly inflated, hyaline, straight, the tip blunt symmetrical. Receptacle variable, hyaline; the main axis consisting of about ten to fifteen hyaline cells, the two lowest larger and suffused with brown, the rest broader than long, and separated by somewhat oblique septa; the hyaline appendiculate cells relatively large, and not concealed by the appendages, which are rich black brown, the lower ones, when unbroken, extending upward far beyond the tip of the perithecium and curved toward it: those arising about its base, and even below it from the inner cells of the appendiculate series, unlike the rest, erect, straight, consisting of a paler basal part, five to six septate, with constrictions at the septa, and a distal unicellular more or less elongate portion. Perithecium (not fully matured) about 85 × 25 μ. Receptacle 75–165 × 15–18 μ. The longest appendages about 300–350 μ.

On the elytra of *Aphænops cerberus* Diek., Ariège, France; Sharp Collection, Type, No. 1142; Berlin Museum, No. 877; Paris Museum, No. 193.

I have found a few specimens of this species in all the collections mentioned, but none are fully matured and only the two figured have perithecia. The species is well characterized by the closely septate appendages about the base of the perithecium, and the long clear rich dark brown appendages of the usual type which arise from the axis and are as long near its base as near its summit. The species is most nearly allied to *R. hypogæus* and all the specimens infested appear to have come from the same locality.

RHACHOMYCES HYPOGÆUS Thaxter.

Single preparations of this species have been obtained from the Hope Collection, No. 304 on *Anophthalmus oblongus* Motsch, Carniola, and from the Berlin Museum on *A. Bilimeki* Sturm. from the Adelaburg Grotto, No. 872: both, however, immature. Several small forms which are perhaps undeveloped individuals of this species were also found in the Paris Museum on *A. hirtus* Sturm., No. 192, and *Anophthalmus* "n. s."

RHACHOMYCES STIPITATUS Thaxter. Plate XLIV, figs. 5–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 438. April, 1900.

Perithecium pale straw-colored becoming tinged with brownish, much darker toward the tip; broadly subfusiform, usually symmetrical, tapering from about the middle to the small blunt usually symmetrical, hardly differentiated, often hyaline tip; borne free on a stalk-cell which is concolorous, sometimes as long as the receptacle, in other cases but slightly developed. Receptacle straw-colored, or faintly brownish with pale "stigmatal" marks; the main axis consisting of about fifteen to seventeen cells, the septa rather oblique, its distal portion, consisting of about two to four cells, erect and free: the cells of the secondary axis relatively large, concolorous, that opposite the subbasal cell of the main axis bearing a long opaque blackish brown appendage curved toward the receptacle and often equalling it in length, other similar appendages arising at intervals above it but not from all the lower cells, becoming more numerous throughout the distal half and in some instances extending to or beyond the tip of the perithecium even in the long-stalked forms, associated throughout with shorter appendages and antheridia. Some of the individuals on *A. Lespezi* small, the main axis of the receptacle consisting of only seven cells, the perithecia nearly sessile and small in proportion. Spores 50–60 × 4 μ. Perithecia 140–150 × 45–69 μ (100 × 30 μ in small specimens), the stalk including basal cells, longest 220 × 47 μ. Total length to tip of perithecium about 550 μ (200–680 μ). Receptacle 325 μ (110–350 μ). Appendages longest 400 μ.

On *Anophthalmus Rhadamanthus* Lind., Hope Coll. No. 306, Greece; on *A. Lespezi* Fair., Paris Museum; No. 185, Grotte des Capucini, Seine et Garonne, France.

Although the types of this species on *A. Rhadamanthus,* which are figured in the accompanying plate, are strikingly unlike the other species, specimens occurring on *A. Lespezi* were found in the Paris collection which, though distinctly smaller, have similar stiff upright appendages, and although it is not so well developed, the perithecium has a distinct stalk. An examination is needed of a large number of these cave forms, and it is barely possible that *R. hypogæus* may tend to vary toward the present species.

RHACHOMYCES GLYPTOMERI Thaxter. Plate XLV, fig. 16.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 39. June, 1901.

Receptacle slender, dirty translucent brown, the main axis consisting of about seven cells (below the lower of the two perithecia which are present in the type): the appendages slightly divergent, large and long, opaque brown, flexed inward near their hyaline, somewhat more slender extremities, and extending beyond the tips of the perithecia. Perithecium short-stalked, strongly curved, slightly inflated, hyaline, soiled with brownish, the tips well distinguished, blackish brown and obliquely truncate. Perithecia, including basal and stalk-cells, about 185 × 44 μ. Receptacle to base of lower perithecium 150 × 15 μ. Appendages, longest 360 μ or more.

On tip of abdomen of *Glyptomerus cavicolus* Müll. Carniola, Austria. Sharp Collection, No. 1141.

The solitary type of this species which is well defined by the shape of its perithecia and the character of its appendages, is illustrated in the accompanying plate. This specimen is no doubt abnormal in producing two perithecia, the axis of the normal receptacle probably not consisting of more than a dozen cells at most; the distal portion in this specimen representing a proliferation such as is seen occasionally in most species of the genus, which gives rise to a second perithecium. The cave-dwelling staphylinid which it inhabits appears to be rare in collections.

RHACHOMYCES CAYENNENSIS Thaxter. Plate XLV, figs. 4–5.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 438. April, 1900.

Perithecium rather small, yellowish, the anterior margin nearly straight, the posterior convex; the tip clearly and abruptly differentiated, concolorous, asymmetrical, somewhat bent. Main axis of the receptacle rather strongly curved, consisting of about twelve cells; the basal ones slender, deeply suffused, those immediately above opaque slender, the rest rather large with central brown suffusions; the distal cells paler. Appendages rather coarse, crowded, black-brown, opaque or nearly so, the tips mostly bent outward, appressed below, somewhat divergent distally; six or more about the base of the perithecium slightly longer than the rest, nearly equalling, sometimes slightly exceeding the perithecium in length. Perithecium 120–140 × 25–30 μ. Total length to tip of perithecium about 350 μ (average). Longest appendages 140 μ.

On *Cryptobium* sp. indet., British Museum No. 387. Cayenne. On the inferior surface of abdomen.

This species is distinguished most readily by the form of the perithecium, straight on the inner side and strongly curved on the outer to the peculiar and well differentiated tip: as well as by its short, stout, curved form, and dense appendages. The small group of appendages characteristically curved outward near the base which are shown at the left in figure 4, appear to be peculiar to this species, although in some specimens they have been broken off.

Rhachomyces furcatus Thaxter.

Specimens of this species, which is well marked by its long appendages and the considerable extension of its axis beyond the base of the perithecial stalk-cell, have been found as follows: Hope Collection, No. 221, on *Othius fulgidus*, no locality: in the British Museum, No. 382 on *O. fulvipennis* Fabr., France; No. 428 on *O. melanocephalus* Grav., Europe and on *O. fulvipennis* Fabr. in the Berlin Museum (immature). In addition to these single specimens of a somewhat paler and more slender variety were found on *O. myrmecophilus* Kies. from Tilgate, England, in the British Museum, No. 440, and in the Berlin Museum, No. 812, on *O. melanocephalus* Grav., from England. This form, however, does not seem separable from the type which is clearly defined and appears to be confined to Europe.

Rhachomyces Cryptobianus Thaxter. Plate XLV, fig. 15.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 437. April, 1900.

Perithecium hyaline or pale straw-colored, very long and slender, nearly isodiametric throughout, almost straight, the tip apparently blunt and not well differentiated. The main axis of the receptacle consists of about sixteen cells; the basal cell and those immediately above it slender black and opaque; the rest becoming larger upward, hyaline suffused or mottled with reddish brown. Appendages numerous, slightly divergent, becoming longer from the base upward, nearly opaque except along the inner margin and at the tip which is generally bent abruptly outward, a group of about six below the base of the perithecium much longer than the rest and curved outward in a tuft, those arising about the base of the perithecium very elongate, erect, with straight blunt tips, reaching nearly to the apex of the perithecium. Perithecium 490–450 × (about) 35 μ. Receptacle 275–430 μ. Total length to tip of perithecium 650–800 μ. Longest appendages 300–430 μ.

On *Cryptobium capitatum*, Paris Museum, No. 172. Brazil.

A fine species remarkable for its long slender perithecium and the characteristic dispositon of its appendages near the base of the latter.

Rhachomyces Oedichiri Thaxter. Plate XLV, figs. 8–9.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 38. June, 1901.

Receptacle strongly curved, rather short, the lower cells especially more or less suffused with clear brown, the basal cell slender, the cells of the main axis above it successively larger, about ten to twelve in all. Appendage hardly ever reaching to the tip of the perithecium; the shorter margin alone subulate and straight, the rest appressed, denser toward the base of the perithecium, where they form a tuft which does not wholly surround it, curved slightly outward, somewhat attenuated; tips abruptly recurved or subhelicoid. Perithecium somewhat inflated with a more or less evident submedian ridge, hyaline, with the exception of several longitudinal dark brown marks at the tip, the base concealed by the appendages. Spores 36 × 4 μ. Perithecia 90–110 × 30–35 μ. Total length to tip of perithecium 220–250 μ. Longest appendages about 90 μ.

On *Oedichirus* nov. sp. Rio de Janeiro, Brazil. Sharp Collection, No. 1154.

This pretty species is distinguished by its short stout curved form; absolutely hyaline perithecium, with small subterminal brown patches; and characteristic appendages, which are mostly similar, gradually longer from below upward and abruptly recurved at the tips, forming a little hook. The species is very constant in its characters, and appears to be most nearly related to *R. Philonthinus*. The host is a staphylinid supposed to be a new species, and is allied to *Pinophilus*.

Rhachomyces Philonthinus Thaxter. Plate XLIV, figs. 3–4.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 435. April, 1900.

Perithecia borne on a short broad hardly visible stalk-cell, reddish brown, inflated toward the base, conical above, straight and nearly symmetrical, the tip blunt, undifferentiated, symmetrical. Main axis of the receptacle distinct, consisting of about twenty cells, the "stigmatal" markings usually conspicuous including about eight to ten cells which form its erect free termination beside the base of the perithecium; the three lower cells mostly suffused with red brown, those above hyaline or partly suffused, increased in size to about the eleventh cell, above which they become successively smaller to the tip of the free portion; the septa for the most part marked by rather prominent constrictions. Appendages numerous but not obscuring the main axis of the receptacle, slightly divergent, mostly tapering distally and slightly bent below the straight hyaline tips; those arising about the base of the perithecium only slightly longer and stouter, brown and mostly blunt tipped, about six in number and as a rule hardly extending to the middle of the perithecium. Spores about 40–45 × 4 μ. Perithecia 140–200 × 40–60 μ. Receptacle 220–340 μ. Total length to tip of perithecium 300–1000 μ. Longest appendages about 100 μ.

On *Philonthus longicornis* Steph., British Museum, No. 408, Island of St. Helena; on *Philonthus* sp. indet., Hope Coll., No. 225, British Isles. Berlin Museum, No. 814 on *P. albipes* Grav., Sweden; No. 827 on *P. exiguus* Nord., Europe. Sharp Coll.; No. 1132, on *P. gastralis* Sharp, Japan; No. 1129 on *P. mutans* Sharp, China; No. 1107 and 1109 on *Amichrotus apicipennis* Sharp, Japan; No. 1193 on *Amichrotus* sp., Japan; No. 1133 on a new genus near *Amichrotus*, Japan.

Although this species has not yet been seen from America, it appears to be widely distributed in the western hemisphere, as is indicated by the above list of hosts. It is a well defined species, varying mostly in size, the very large specimens (fig. 3) occurring on *Amichrotus*, a genus said by Dr. Sharp to be very near, if not identical with *Philonthus*. Its numerous rather short stiff appendages do not differ greatly in length throughout the receptacle, and are characteristically bent at the tips. An individual typical in form and size is represented in fig. 4 which was obtained from a British *Philonthus*. The species is most nearly allied to *R. Oedichiri* and *R. arbusculus*, the latter differing in the form of its perithecium and the differentiation of its appendages.

RHACHOMYCES DOLICAONTIS Thaxter. Plate XLIV, fig. 8.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 39. June, 1901.

Form elongate. Cells of the main axis of the receptacle twenty to thirty-five, more or less dirty brownish, banded with dark blackish brown below, while the more slender proximal cells are usually opaque; the axis of nearly equal diameter throughout and nearly straight above about the eighth cell; each cell containing distally one, the axis cells two, roundish or oblong brown bodies (possibly valve-like structure) which suggest the stigmata of an insect larva. The appendages somewhat divergent, opaque, except a narrow upper hyaline margin, short, stiff and numerous; those external more slender, slightly curved and sharply pointed; those between somewhat stouter and longer, with slightly recurved tips; those about the base of the perithecium, which they do not conceal, but slightly longer and few in number. Perithecium short-stalked, slightly more or less symmetrically inflated, dull brown, minutely punctate or granular, not uniformly suffused; the tip with darker shades, the blunt apex hyaline. Spores 66 × 5 μ. Perithecia 150–200 × 42–60 μ, including the basal and stalk-cells. Larger appendages 90–110 μ, smaller about 75 μ. Total length 600-1100 μ, the average diameter about 30–35 μ.

On all parts of *Dolicaon Lathrobioides* Casteln. Cape of Good Hope, Africa. Sharp Collection, No. 1146. Berlin Museum, Nos. 833 and 842.

A specimen of this large staphylinid in Dr. Sharp's collection was found completely covered by this fine species. It differs from the other elongate forms in its rather small and not very numerous mostly divergent appendages. The peculiar stigmata-like markings on the cells of the receptacle are unusually conspicuous in the species, and the dark lines which separate the perithecial wall-cells are usually more pronounced than is indicated in the figure. The surface of the perithecium appears to become granular as it matures, and more deeply suffused with brown. The characters of the species are very constant although there is some variation in size.

RHACHOMYCES LONGISSIMUS Thaxter.

Fine specimens of this species, which is the largest of the genus and may reach a length of almost two millimeters, have been obtained in the British Museum on *Colpodes evanescens* Bates No. 694, Totonicapan, Guatemala; on *C. proteinus* Bates, No. 699, Vera Paz, Guatemala; on *C. reflexus* Chaud., No. 1042 from Columbia. It shows a certain amount of variation in color, few specimens being as dark as the one represented in my Monograph. The appendages also are often more widely separated from one another, and the axis relatively stouter. It recalls *R. Dolicaontis* which, however, lacks the successive pairs of divergent appendages which are so characteristic in this species as well as in *R. tenuis*, to which it appears to be most nearly allied.

RHACHOMYCES TENUIS Thaxter. Plate XLIV, fig. 7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 437. April, 1900.

Perithecium relatively small, the lower half or more hidden by the appendages, hardly inflated, faintly tinged with brown, tapering very slightly to the tip, which is suffused with dark brown, broad, hardly differentiated and slightly asymmetrical. Receptacle very long and slender, the cells of the main axis thirty to forty in number, dark reddish brown or nearly opaque, subhyaline below the somewhat oblique septa, except the lower members of the series, which are as a rule wholly opaque; the cells increasing slightly in size from the base upward. Appendages straight, narrower distally, rather short and appressed, not very numerous; those about the base of the perithecium, about twelve in number, somewhat larger and longer than the rest, surrounding and concealing it more or less completely; some of the lower appendages also longer and curved conspicuously outward, as are the antheridia. Perithecia about 110 × 30 μ. Longer appendages about 140–160 μ. Greatest width of receptacle about 20 μ. Total length to tip of perithecium 800–1000 μ.

On the legs of a small carabid beetle, Paris Museum, No. 113. Java.

This elegantly formed species is distinguished from *R. longissimus*, which appears to be its nearest ally, by its more slender form, its more slender and differently shaped perithecium and the character of its appendages, which are quite different, although the same succession of projecting pairs occurs, the members of which, unlike those of *R. longissimus*, are subulate and not recurved.

RHACHOMYCES JAVANICUS Thaxter. Plate XLV, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 314. July, 1905.

Perithecium straight, symmetrical, tapering slightly distally, translucent, brown, the tip opaque blackish brown, the apex hyaline and blunt, the whole surrounded and more or less hidden up to the tip by the appendages. Receptacle rather long and slender, the main axis normally consisting of more than twenty cells which are clearly distinguishable, more or less suffused with blackish brown, less so toward the base, more or less hyaline at, and obliquely below, the septa; the appendiculate cells giving rise to a dense series of similar black subequal appendages, their inner edges somewhat hyaline, with slightly upturned and enlarged bluntly pointed hyaline tips, more numerous distally and forming a dense tuft below and around the perithecium which they conceal, except for its projecting tip. Perithecium 95–110 × 35–40 μ. Receptacle 275–350 μ by about 18 μ. Total length 350–460 μ. Appendages, longer, about 90–100 μ.

On legs of a small Harpaloid (?) beetle brought from Buitenzorg, Java, by Dr. H. M. Richards.

Closely allied to *R. velatus*, but differing in its smaller size more slender form and fewer stouter appendages, which do not conceal the axis as in *velatus*.

RHACHOMYCES VELATUS Thaxter. Plate XLIV, fig. 9, XLV, fig. 3.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 435. April, 1900.

Perithecium short stout straight symmetrical, evenly inflated, pale brownish, translucent; the tip abruptly dark brown, opaque or nearly so, tapering symmetrically to the blunt rounded apex. Receptacle varying in length, consisting of perhaps eighteen to twenty cells, the basal cell and sometimes two or three of those above it hyaline or nearly so, the rest indistinguishable, being concealed by the densely crowded appressed appendages, which are rather short and slender, deep brown or opaque except along the inner margin and at the tip; those around the base of the perithecium also densely crowded, subequal blunt-tipped, wholly suffused, completely enveloping it and wholly concealing it till it is fully developed when the tip alone projects beyond them. Spores about 35–40 × 3–4 μ. Perithecia 175 × 75 μ or smaller. Total length to tip of perithecium 400–550 μ. The longer appendages about 120 μ.

On *Colpodes agilis* Chaud., British Museum (Biologia Coll.), No. 696, Jalapa, Mexico; on *C. atratus* Chaud., British Museum (Biologia Coll.), No. 698, Irazu, Costa Rica; on *Gynandropus Mexicanus* Putz., British Museum (Biologia Coll.), No. 682, Cordova, Mexico. Usually on legs.

This species, which in general appearance suggests a young shoot of larch or spruce, owing to its densely crowded appressed and undifferentiated appendages, is distinguished by its broad stout perithecium, which is usually almost completely concealed by the somewhat longer appendages which arise about its base, and by the enormous numbers of the latter which also render the main axis quite indistinguishable. The only species with which it might be confused is *R. Javanus* in which, however, the appendages are much less numerous. The individuals on *Gynandropus* (fig. 3) have been taken as the type, although they do not appear to differ essentially from those on *Colpodes*. In fig. 9, Plate XLIV, the perithecium has become visible owing to pressure of the cover glass.

CLEMATOMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 439. April, 1900.

Receptacle consisting of a basal and a subbasal cell from which arises distally a main axis bearing a terminal perithecium and formed from a double row of cells; the cells of the external row producing sterile appendages, those of the inner producing secondary axes similar in structure to the primary one, or antheridial branches; the secondary axes producing antheridial or sterile branches on both sides, and like the primary ones bearing a single terminal perithecium. The antheridia simple, borne singly, or usually in whorls, from the distal end of the successive cells of the antheridial branchlet, which consists of several superposed cells.

The structure of the receptacle in this genus, although it suggests that of *Distichomyces*, is unlike that of any other type, consisting as it does of two axes or cell-rows; an anterior (inner) bearing mostly fertile branches, and a posterior bearing sterile appendages. The antheridial appendages which occur both in the main anterior axis, and on its secondary branches, when the latter are well developed as in fig. 2, recall the appendages of *Arthrorhynchus* but they vary considerably both as regards the number of cells which compose them and of antheridia which they bear. The wall-cells of the perithecia are more numerous than usual, there being apparently seven in each row, although the lower apparent wall-cells may prove to be upgrowths of the basal cells which function as wall-cells. The affinities of the genus are doubtful and although the appendages are so similar to those of *Arthrorhynchus* the type may prove to be more nearly related to *Moschomyces* and *Compsomyces*.

Clematomyces Pinophili Thaxter. Plate XLIII, figs. 1–2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 440. April, 1900.

Nearly hyaline or yellowish, the basal and subbasal cells small, the cells of the main axis in six to twelve pairs more or less alternate on either side, each cell of the outer series giving rise to a three- or four-celled usually simple generally appressed sterile appendage, the terminal cell of which is often smoky brown, its basal cell almost wholly united to the cell of the axis next above; the secondary axes one to three in number, usually with a single basal cell, the external branches more often simple and sterile, the inner fertile; the antheridial appendages of both primary and secondary axes more often simple, sometimes sparingly branched, those near the perithecia bearing the greatest number of antheridia which may arise singly or opposite in pairs, or in whorls of three or four from the distal (one to four) cells of the appendage. Perithecium solitary, sessile at the tips of the primary and secondary axes, often straight and symmetrical tapering to the truncate unmodified apex, pale becoming amber-brown. Spores about 38 × 3 μ. Perithecia 100–150 × 25–40 μ. Sterile appendages, longer 100 × 7 μ. Greatest length to tip of perithecium (main axis) 300–400 × 35 μ.

On inferior surface of thorax of *Pinophilus* sp. indet., British Museum, No. 390, Burmah, India.

In the individual figured, the basal and subbasal cells are abnormally placed or the latter is abnormally septate. In the other specimens these two cells are directly superposed. The species shows a good deal of variation in the number of cells composing both the main and secondary axes, and also in the number and position of the latter.

COMPSOMYCES Thaxter. I. p. 366

This genus and *Moschomyces*, which may prove to be not generically separable from it, are decidedly isolated, and it is difficult even to suggest the probable affinities of the few species thus far discovered. It seems to me that it is better to regard the perithecia as arising from a single stalk-cell which is in turn borne on an appendiculate branch from the receptacle consisting of a single cell. The sterile appendages, or certain of them, are peculiar in having slightly oblique septa when young, and it is only in this group that asci with eight spores are definitely known to occur.

COMPSOMYCES LESTEVI Thaxter. Plate XLIII, figs. 9–12.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 439. April, 1900.

Receptacle consisting of a small basal and subbasal cell, the latter giving rise to rarely more than two branches; one of which consists of a basal cell, from the upper side of which the stalk-cell of the perithecium arises; while externally it gives rise to a characteristic sterile branch, simple, usually slightly upcurved, rather closely and somewhat obliquely septate, commonly consisting of about nine superposed cells, tapering rather abruptly at the tip. Perithecium borne on a well developed erect stalk-cell, nearly symmetrical, tapering from about the middle to the broad truncate undifferentiated tip; the basal cells small, but slightly distinguished from the inflated base of the ascigerous portion, the spores few and relatively large. The other branch arising from the subbasal cell of the receptacle, an antheridial branch, divergent, consisting typically of four superposed cells above which it becomes furcate, dividing into two branches which are large stout tapering, distally curved; the third cell of the appendage producing a single short flask-shaped antheridium distally on its inner side and sometimes giving rise to a branch similar to those above. Spores 42 × 4 μ. Perithecia 75–85 × 30–35 μ, the stalk 75 × 22 μ. Antheridial appendage including branches 275 μ, the basal part about 60 × 20 μ.

On abdomen and elytra of *Lesteva sicula* Erich, British Museum, Nos. 452 and 453, Paisley and Red Hill, England: on *L. pubescens* Mannerh., No. 1094, Scotland: on *Lesteva* sp. No. 1175. Savoy, in Sharp Coll.

This species differs from the type of the genus in having a single antheridium definitely placed on a main appendage; at least this appears to be the condition in all the specimens examined which have been in sufficiently good condition to show the antheridium at all. At first sight it might seem wholly different from *C. verticillatus* from the apparent absence of a basal appendiculate cell below the stalk-cell of its perithecium; but an examination of young specimens shows, as in fig. 12, that this appendiculate cell is present, although very small, and as the individual matures the enlargement of the stalk-cell, as well as of the basal cells of the other appendages, causes it to become obscured and displaced, so that the stalk-cell itself appears to arise directly from the subbasal cell of the receptacle. That this is not the case is clearly seen in the figure mentioned, which also shows the position of the single antheridium. The material from Dr. Sharpe's collection is in somewhat better condition than the types, but does not vary greatly. The specimens from Scotland have more slender perithecia, but do not seem otherwise different.

MOSCHOMYCES Thaxter. I. p. 368

M. insignis, the only known species of this genus, appears to be a rare form; but this is perhaps owing to the fact that I have been unable to obtain its host in any considerable numbers. It has been collected in one instance on *Sunius longiusculus* at Kittery Point, Me., on one of many specimens of the host examined. As I have previously pointed out, it may prove only a very curious development of *Compsomyces*, to which it is at least very closely allied. As in the case of the genus last mentioned, it has seemed best to regard the basal stalk-cells of the perithecia as branches from the receptacle, from which the perithecia originate as well as the peculiar sterile branches which subtend it, rather than as parts of a compound perithecial stalk-cell.

Chætomyces Pinophili Thaxter. I. p. 364

Three specimens agreeing in all respects with the types of this species were found in the Biologia Collection at the British Museum on an undetermined species of *Pinophilus*, No. 765, from Chontales, Nicaragua. The species still remains the unique type of a genus not closely approached by any other thus far described. It is clearly distinguished by its simple axis of superposed cells one or more of which immediately below that which bears the perithecium, give rise to branchlets. No other form has perithecia and branches similarly associated on a simple axis of this nature, which appears to be entirely primary, and not in any part a secondary development from a primary receptacle such as is seen in *Rhachomyces*.

ECTEINOMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 26. June, 1902.

Receptacle consisting of a single series of superposed cells, becoming variable in number as a result of intercalary division; bearing distally a single perithecium and an antheridial appendage. The appendage consisting of a series of superposed cells, several of which, above its basal or stalk-cell, bear simple antheridia, which are cut off distally on one or both sides, by oblique septa.

This genus, although it lacks any very striking characteristic, is one of the rare instances in the family in which the primary receptacle becomes multicellular through intercalary divisions of its cells. The appendage in young specimens consists of several superposed cells, the lower of which cut off simple antheridia distally by an oblique septum, while later they develop a variable number of filamentous branches. The genus appears to bear some resemblance to *Compsomyces* in the character of its perithecium and antheridia, and also to *Hydrophilomyces* and *Misgomyces* in the presence of intercalary growth, and in the general relations of its parts.

Ecteinomyces Trichopterophilus Thaxter. Plate LI, figs. 15–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 26. June, 1902.

Wholly hyaline with the exception of the typically blackened foot. Receptacle varying from a very long and slender to a comparatively short and stout form, the number of superposed cells varying in number from five to fifteen, or rarely more; the cells often hardly larger distally; the series as a whole often irregular, the successive cells irregularly unequal in length. Appendage similar to the receptacle, consisting of five or six superposed cells; the basal cell united to the stalk-cell of the perithecium; the subbasal cell sterile; two or three of the cells above it bearing one to two antheridia each, which may be replaced by sterile branches similar to those which always arise from the terminal cells of the series, both laterally and terminally. Stalk-cell of the perithecium short, not distinguished from the basal cells; the body of the perithecium oblong or oval, tapering abruptly distally to form the slender well-distinguished tip, which tapers slightly to the blunt unmodified apex. Spores 25 × 3 μ. Perithecia 55–65 × 22–28 μ. Appendage including branches 75–100 μ. Receptacle 25–140 × 7–12 μ. Total length to tip of perithecium 100–220 μ.

On the elytra of *Trichopteryx Haldemani* Lec., Intervale, N. H. On species of *Trichopteryx*, near Fresh Pond, Cambridge, and at Kittery Point, Maine.

This species seems to be commonly distributed on various species of its curious and microscopic host, which is the smallest insect thus far known to be infested by Laboulbeniales. It varies very considerably in the amount of secondary growth of its receptacle, the extremes in this respect being illustrated by figs. 15–17. The host is often very abundant in piles of moist vegetable refuse.

MISGOMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 443. April, 1900.

Receptacle indeterminate, consisting of numerous cells superposed singly, or in tiers of two or three cells each, ending distally in an appendiculate portion not clearly distinguished from the receptacle, and a solitary perithecium, the two related to one another somewhat as the corresponding structures are related in *Laboulbenia*. (Antheridia simple and borne free on the short appendages?).

In the absence of any exact knowledge as to the antheridia, it is not possible to define this type very precisely, although its general characters are such as to distinguish it very clearly from other genera unless perhaps from *Ecteinomyces*, which also possesses an indeterminate multicellular receptacle. The antheridia seem to be evanescent, and in even the youngest specimens, in which the perithecium is quite undeveloped, what appear to be the remains of them, only, have been seen. The appendages are not well developed and are irregular in their origin; the primary "appendage" from which they arise recalling that of *Ceratomyces*, although less definitely differentiated and varying considerably. It seems safe to assume from an examination of the material available that the antheridia are simple and free, but it is to be hoped that European observers may obtain fresh material of the young conditions of *M. Dyschirii*, which appears to be common on various species of *Dyschirius*, in order definitely to determine this point. Until the antheridia are known, it is difficult to judge of the nearest relationships of the genus, but the character of its receptacle would appear to ally it to *Ecteinomyces*, although the primary appendage is clearly distinguished in this genus and the perithecium is different in character.

Misgomyces Dyschirii Thaxter. Plate LXX, figs. 9–10.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 443. April, 1900.

Rather rich amber-brown, the receptacle consisting of from eight to twenty-three superposed cells, the upper ones rarely divided longitudinally, the distal cell lying between several, usually three, smaller cells which become separated from it on either side, and which, together with its base, are united to the base of the perithecium; while above it, and separated from it by a thin dark insertion, a cellular base gives rise to the group of appendages, the irregular basal cells of which alone remain in the material examined. Perithecium nearly oval or very slightly pointed, the tip and lips undifferentiated. Spores, seen only in perithecium, with base apparently abruptly recurved or bent, about 60 × 3.8 μ. Perithecia 70–85 × 35–40 μ. Receptacle 135–400 μ. Total length to tip of perithecium 200–435 μ.

On *Dyschirius globosus* Herbst., Hope Coll., No. 349, England; on *D. salinus* Schaum., British Museum, No. 582, Europe. On *D. politus* Dej., *D. externus* Sch., *D. digitatus* Dej., *D. nigricollis* F., *D. læviusculus* Putz., Europe, Berlin Museum Nos. 894, 895, 896, 897.

This species is very clearly distinguished from the next by its amber-brown color, more simple receptacle and differently shaped perithecium. It does not appear to be rare on species of *Dyschirius* in England and on the continent, but has always been found with the appendages badly broken, so that no antheridia are visible, and even the appendages themselves can with difficulty be made out. The host is a minute carabid allied to *Clivina*.

Misgomyces Stomonaxi Thaxter. Plate LXX, figs. 7–8.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 443. April, 1900.

Hyaline or pale straw colored. Receptacle consisting of a basal and one or two more single superposed cells, the cells above these becoming rather irregularly divided longitudinally to form a double row of variable length, above which a second longitudinal division appears, the receptacle in this region being made up of three-celled tiers as far as the base of the perithecium, above which its distal part consists of several superposed pairs of cells, or of two rows of cells more irregularly distributed, the insertion of the appendages rather indefinite, the cells composing it producing irregular hyaline or brownish branches distally. Perithecium externally nearly straight, the inner margin convex, the tip rather abruptly differentiated, straight or curved outward. Perithecia 90–100 × 25–30 μ. Receptacle 300–335 μ. Total length to tip of perithecium 365–400 × 40–45 μ.

On *Stomonaxus striaticollis* Dej., British Museum No. 593, China. On elytra.

This species is based on three specimens, two of which are illustrated in the accompanying plate. It differs from *M. Dyschirii* chiefly in the form of its perithecium, and in the fact that its receptacle consists not of superposed cells but of tiers of cells. It is possible that I am in error in associating these forms under one genus; but until sufficient material can be examined, there seems to be no better disposition possible. A fourth specimen apparently identical with the others was found in the Paris Museum, No. 17, on a small harpaloid (?) carabid from Madagascar.

CERATOMYCETINEÆ.

Antheridia more or less undifferentiated cells of the appendages or of their branches. The species for the most part aquatic.

HYDROPHILOMYCES nov. gen.

Ceratomyces Thaxter *pro parte.*

Receptacle consisting of an indeterminate series of superposed cells indefinitely multiplied by intercalary division and with occasional longitudinal septa. Axis of the appendage similar to that of the receptacle and continuous with it, giving rise to a double row of branches arising from small cells separated distally and obliquely from its successive members; many of these small cells nearer the base apparently converted directly to pointed antheridial cells. Perithecia consisting of a small and determinate number of cells.

There appear to be not more than five cells in each lateral and in the inner row of wall-cells, and perhaps but four in the outer, while the perithecium is developed in relation to the trichogyne like other members of the family, and not in the fashion peculiar to *Ceratomyces* and its near allies which was described in my Monograph. It is possible that I am mistaken in regarding the beaked cells of the appendage (Plate LXVIII, figs. 3–4) as antheridia, since I have seen no actual discharge of sperm-cells; on the assumption that they are, the genus may, however, be provisionally placed not far from *Ecteinomyces*. At least two more undescribed species on Hydrophilidæ have similar characters.

For a further comparison of this type with the assemblage of species formerly placed by me in *Ceratomyces* reference should be made to the last mentioned genus under which these matters are discussed.

Hydrophilomyces rhynchophorus nov. comb. Plate LXVIII, figs. 1–4.

Ceratomyces rhyncophorus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 446. April, 1900.

Hyaline. Receptacle long slender, but slightly narrower below, consisting of about forty (thirty-five to fifty) superposed cells, wider than long; those in the lower half more flattened, the foot small. Perithecium lateral, nearly erect, slightly divergent; a short but definite stalk-cell; the basal wall-cells greatly elongated, extending some distance up around the ascus-mass and forming, together with the large elongated inferior supporting cell, a broad sterile base to the perithecium which is not differentiated from its main body; the cell rows consisting of but five cells, including the very small lip-cells, and the cells of the sterile base; the three upper tiers of cells forming an abruptly differentiated, thick walled, long, tapering beak-like termination, curved outward or inward, often at right angles; below which the distal end of the outer wall-cell forms a slight rounded prominence, the very small lip-cells forming a slight enlargement. Appendage similar to and continuing the axis of the receptacle directly, or diverging very slightly; the cells giving rise to a double series of branches, which are subtended by small cells obliquely separated at the distal angles, those from the lower cells short (antheridial ?), those from the upper long and several times branched; the main appendage usually broken, but in young individuals consisting of from twenty to twenty-five superposed cells. Spores 48 × 3 μ. Perithecia, ascigerous portion 175 × 45–50 μ, beak-like termination 140–160 μ, sterile basal portion about 100 μ. Receptacle 270–430 × 30–35 μ. Appendage (young individuals) 350 μ, the branchlets 200 × 6 μ.

On legs and inferior surface of *Phænonotum estriatum* Say. Eustis, Florida, October.

Although but a small percentage of individuals of this host were found to be infested, abundant material was obtained, the beetles occurring in large numbers on the under side of pieces of board floating along the margin of Lake Eustis. In two individuals the parasite was attached to the inner surface of the elytron near its tip, all the individuals being remarkable for the monstrous development of the perithecium which reached a maximum length of one millimeter. It is possible that the following species may also be a similar variation due to its position of growth. Although the branches of the appendage are originally opposite in two rows, the latter become as a rule approximated on the inner side, as a result of greater external growth in the cells of the main axis.

Hydrophilomyces reflexus nov. comb. Plate LXIX, fig. 3.

Ceratomyces reflexus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 447. April, 1900.

Hyaline with a few purplish or reddish suffusions on the receptacle, which is composed of from about twenty-five to fifty superposed cells with occasional longitudinal septa; the foot hyaline, or slightly yellowish, much enlarged, bladder-like or spherical; the distal portion distinctly broader, its axis coincident with that of the erect appendage which forms a direct continuation of it. Perithecium small with few asci, abruptly recurved at the base, its apex thus sometimes touching the inflated foot; nearly straight, tapering almost symmetrically to the blunt slender tip; the ascigerous cells situated at the base just above the small angular stalk-cell. Appendage usually flat and broader than the receptacle toward its base, the superposed flat cells of which it is composed producing appendages on either side much as in *C. rhynchophorus.* Spores 70 × 4 μ. Perithecia 140 × 20 μ. Receptacle 140–280 μ. Appendage 200–400 μ. Foot about 30 × 30–38 μ.

On *Phænonotum estriatum* Say. Eustis, Florida, October.

Specimens of this species were found on several individuals, but never fully matured, growing on the soft integument of the upper surface of the abdomen just beneath the elytra, from under which they may be seen projecting. The branches of the primary appendage remain opposite and the basal cell of the receptacle assumes a bulbous form. The cells of the receptacle, in fresh material, were characterized by reddish suffusions suggesting phycoerythrin. The great elongation of some of the specimens is noteworthy, the receptacles comprising from forty to fifty superposed cells. As previously mentioned this species may prove to be ~~nearly~~ an abnormal form of *H. rhyncophorus.*

RHYNCHOPHOROMYCES nov. gen.

Ceratomyces Thaxter *pro parte.*

Receptacle indeterminate, consisting of a considerable and variable number of superposed cells terminated directly by the perithecium. Perithecium consisting of a well defined venter and clearly distinguished neck in which the wall-cells are very numerous and indeterminate. The base of the appendage indistinguishable from the venter of the perithecium, from the walls of which it appears to arise at maturity, together with its basal branches. Antherozoids extruded and abjointed distally and laterally, and for the most part singly, from cells composing the branchlets of the appendage.

The type of this genus, *R. rostratus*, was formerly included in *Ceratomyces* but, as I have pointed out below under the last mentioned genus, there can be no question as to the advisability of separating the three well marked species here enumerated in a group by themselves. As the venter of the perithecium develops, the whole base of the appendage becomes incorporated with it, as well as the basal cells of its lower branches, which actually, in the end, form a portion of the perithecial wall, and seem to arise, as is shown in Plate LXVIII, fig. 5, from wall-cells above the base of the main appendage. The neck, or trunk-like prolongation of the perithecium is most characteristic, and at maturity becomes abruptly reflexed in all the species, while in the two described below, it is further peculiar in possessing tooth-like outgrowths below the curvature. The known species all inhabit water beetles belonging to the Hydrophilidæ, and have been found in North America and Oceanica.

Rhynchophoromyces elephantinus nov. comb. Plate LXVIII, fig. 5.

Ceratomyces elephantinus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 446. Apr., 1900.

Faintly tinged with pale amber-brown; the neck stout, its upper three fifths (more or less) abruptly recurved: certain corresponding cells of two opposite rows just below this curvature producing broad rather short, blunt, tooth-like outgrowths, one to two or three to four, usually, in each group, or sometimes solitary from one group only; the tip snout-like, broad, slightly and irregularly sulcate. Receptacle consisting of from seventeen to twenty-two squarish or flattened cells, sometimes hardly broader distally. Appendage producing numerous long slender flexuous branches repeatedly branched. Perithecia, ascigerous part, about 140 × 65 μ, the neck to recurved part 475–525 μ; recurved part 390–400 μ. Spores 70 × 3.5 μ. Receptacle 370–550 μ. Longest branch of appendage 600 μ.

On legs of *Hydrobius* (?) sp., Eustis, Florida.

This very striking species is closely allied to *R. denticulatus*, but differs in general form and size, and especially in the number and character of the tooth like perithecial appendages or outgrowths. The accompanying figure shows the posterior view of an individual, the cells in the median line above the receptacle corresponding to the base of the appendage, and the upper cells cut off from this row corresponding to the main basal branches of the appendage. The host, a rather large hydrophilid, possibly *Hydrobius* sp., was found swimming in rain pools in the pine woods near Lake Eustis.

Rhynchophoromyces denticulatus nov. comb. Plate LXX, fig. 1.

Ceratomyces denticulatus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 445. April, 1900.

Amber-brown, the ascigerous portion of the perithecium slightly inflated and rather abruptly distinguished from the elongate neck, which at maturity is straight or slightly sinuous; the cell rows containing about fifty-five cells, the neck more slender toward the base, distally somewhat broader; successive cells in two adjacent rows in this broader portion projecting to form well marked rather slender tooth-like blunt outgrowths, directed obliquely upward and separated by a basal septum, one series usually consisting of five cells, sometimes six, the cells immediately below often bulging prominently or forming shorter tooth-like outgrowths; the second series consisting of usually not more than three well defined similar tooth-like outgrowths: above these two series the upper fifth (about) of the neck is bent abruptly backward, lying nearly parallel to the portion below it; the tip broad snout-like, the lip-cells forming a small papillate prominence above and external to a broad rather distinctly differentiated cell, which terminates one of the inner rows, and is almost as large as the lip-cells taken together. Receptacle rather slender, tapering toward the base, consisting of (about) ten superposed cells, exclusive of the foot-cell, which is not always wholly blackened. Appendage as in *C. rostratus*, the numerous branches and branchlets rather slender, not very long, forming a rather compact tuft more or less appressed around the base of the perithecium. Perithecium, ascigerous portion about 85 × 35–40 μ, neck to recurved portion 475–500 × 20–25 μ, recurved portion about 125 μ, tooth-like projections 15–35 × 6–7 μ. Receptacle (ten superposed cells) 130–150 μ. Appendages (longest branches) 175 × 3 μ.

On under surface, of a small hydrophilid beetle, Paris Mus., No. 11, Isles Mariannes, Oceanica.

Sufficient material of this species was obtained from alcoholic specimens of its host, and is in very good condition. The cells of the receptacle often appear to be longitudinally divided as in fig. 1; but the smaller apparent cell is merely a space between the general envelope and the cell-wall proper. The species is most nearly related to *R. elephantinus*, from which it is distinguished by its smaller size, more slender habit, shorter appendages, amber-brown color, and by the more numerous and differently formed tooth-like outgrowths from the perithecial neck.

AUTOICOMYCES nov. gen.

Ceratomyces Thaxter *pro parte*.

Receptacle consisting of three superposed cells, the lowest often involved by the blackened foot, the upper surmounted by a pair of cells giving rise to the single perithecium and the antheridial appendage respectively. Antheridial appendage consisting of a series of superposed cells producing ramigerous branches irregularly along its inner margin. Perithecium usually appendiculate, determinate, the wall-cells in rows of seven and eight members.

This genus which I have already pointed out, is very nearly related to *Ceratomyces* emend., differs in the constant and comparatively small number of cells forming the rows of wall-cells in the perithecium; the inner and outer rows having eight and the lateral rows seven in all species examined. All the known forms inhabit species of a single genus, *Berosus*, a fact which has suggested the generic name, and of the six that have been described, one occurs in the East Indies, while the rest are American. In addition to the three forms illustrated herewith, three others, *Autoicomyces furcatus*, *A. distortus* and *A. humilis* were formerly included in *Ceratomyces* and it may be mentioned that a seventh species is known to occur on *Berosus* in South America. All the species have a certain family resemblance and are for the most part pale, or quite hyaline. *A. humilis*, of which good material has been again obtained from the type locality, is the only form which lacks a perithecial appendage, the conformation of its tip being rather exceptional, the edges spreading somewhat and pointed, not compressed as in the other species. *A. contortus* has also been found on the same host in the vicinity of Fresh Pond, Cambridge, but the other New England species have only been met with in the small pond, formerly referred to, on the highest point of Cutt's Island, at Kittery Point, Maine.

Autoicomyces acuminatus nov. comb. Plate LXVIII, fig. 8.

Ceratomyces acuminatus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 447. April, 1900.

Hyaline. Receptacle consisting of three superposed cells, the basal cell partly suffused and continuous with the blackened foot. Perithecium rather stout, the outer margin nearly straight, the inner strongly convex; the seventh wall-cell of the inner row greatly enlarged, its outer wall very thick, forming an erect tapering bluntly pointed terminal appendage, at the base of which the papillate apex of the lip-cells projects on the right side; the fifth cell of the external row of wall-cells growing out to form a subterminal slender appendage, eight-celled in the type, distally attenuated, its terminal cell bearing one or two slender branches. Appendages consisting of from four to five superposed cells, the distal ones appendiculate (the branches mostly broken). Perithecium 185 × 40 μ. The appendage without branches 82 μ, the branches 150 μ; the rostrate terminal cell 50 × 17 μ (at base). Receptacle 85 × 48 μ. Spores about 70 × 3.5 μ. Appendage, broken, without branches 70 μ.

On the inferior surface of abdomen and thorax of *Berosus* sp. indet. Eustis, Florida, October.

A few specimens of this well marked form were found in Lake Eustis on a *Berosus* very like *B. striatus*. The conformation of its tip and the character of its perithecial appendage distinguish it from other species of this genus.

Autoicomyces ornithocephalus nov. comb. Plate LXIX, figs. 7-8.9

Ceratomyces ornithocephalus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 448. April, 1900.

Hyaline or becoming more or less suffused with amber-brownish. Perithecium relatively rather small, the external margin somewhat concave, the inner convex, the four distal cells of the eight external wall-cells rather abruptly enlarged, their external walls much thickened and forming an irregularly rounded crest-like prominence, the distal half of the margin of which becomes abruptly almost horizontal, terminating near the base of the beak-like pointed apex, which projects somewhat obliquely from the right side: the external row of wall-cells producing above the fourth cell a large appendage, geniculate at its base, tapering distally where it curves outward, consisting of from ten to twenty cells, the terminal cell rarely bearing one or more slender branches. Receptacle consisting of three superposed cells, the basal one usually opaque, except distally, and continuous with the foot, surmounted by two cells from which arise the perithecium and the appendage. The appendage (usually broken) curved outward and upward, consisting of about ten superposed cells, the upper ones giving rise to few branches on the inner side, which may be several times branched, the branchlets slender, mostly erect and rather rigid. Spores about 70 × 30 μ. Perithecia 120–160 × 35–45 μ, the crest-like tip 38–45 μ broad, the appendage 120–325 μ. Receptacle 85–120 μ. Appendage, exclusive of branches 140–150 μ. Total length to tip of perithecium 210–290 μ.

On margin of right elytron toward the apex, of *Berosus striatus* Say. Kittery Point, Maine.

Occurring rather rarely and always in the same position in company with *T. furcatus*, *T. distortus*, and *T. humilis*, all of which inhabit *Berosus* in a small pond at the summit of Cutts Island. It is easily separated from the other species by the conformation of the tip, which suggests a beak, subtended by a crest or rounded cockscomb.

Autoicomyces falciferus nov. comb. Plate LXXI, fig. 19.

Ceratomyces falciferus Thaxter. Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 318. July, 1905.

Allied to *A. furcatus*, hyaline, the inner margin of the perithecium and the base of the appendage suffused with amber-brown, becoming blackish and opaque below the appendage. External margin of the perithecium nearly straight, the inner strongly convex; the pointed tip curved to the base of the large, long, sickle-shaped, external, subterminal perithecial appendage, which consists of about twenty-five to thirty superposed cells, and is curved outward. Receptacle consisting of three superposed cells, surmounted by two cells from which the perithecium and antheridial appendage arise; the latter consisting of six or more cells, bearing branches like those of the other allied species on *Berosus*. Spores 55 × 4 μ. Perithecium 125–150 × 55–65 μ, its appendage 435–470 × 22 μ. Receptacle 90–110 × 35 μ. Appendage, without branches, 110–125 μ. Total length to tip of perithecium 250 μ.

On left inferior margin of abdomen of *Berosus* sp., Java; Rouyer, No. 1393.

A species most nearly related to *A. furcatus*, but differing in its small antheridial appendage and very large falcate perithecial appendage, as well as in other points.

CERATOMYCES Thaxter. I. p. 372

A revision of the numerous forms which I have published under this name, and the examination of still further material, has led me to the conclusion that at least four distinct types are best separated generically in this assemblage. The largest of these to which the original name *Ceratomyces* may be applied, includes fifteen described species among which *C. mirabilis* may be taken as the type. All of these are parasitic on the aquatic genus *Tropisternus*, with the single exception of *C. terrestris*, which almost certainly should be placed in a genus by itself, its antheridial branchlet (Monograph, Plate XXV, fig. 23) and its general characters being not closely comparable to those of any described genus. Until it can be reexamined in a fresh condition, or until other nearly allied forms are discovered, it seems best, however, to avoid a new generic name by retaining it provisionally in the present connection.

A second group of forms which, from the fact that they are all parasitic on species of a single aquatic genus, *Berosus*, may be appropriately called *Autoicomyces*, is represented by the six described forms above enumerated, and a seventh as yet unpublished. The members of this section differ from *Ceratomyces* in having a small and determinate number (seven and eight) of wall-cells in the perithecia.

The third group, of which the form previously described as *C. rostratus* may be taken as the type, I have called *Rhynchophoromyces* from the monstrously developed necks which characterize the perithecia of the species. The receptacle in this genus is many-celled and indeterminate, the perithecium distinguished into neck and venter, and later confluent with the base of the appendage, and at maturity its axis is coincident with that of the receptacle.

Lastly the two species formerly described as *C. rhynchophorus* and *C. reflexus*, together with two or three others as yet unpublished, appears to differ very widely from all the other types, possessing a straight erect axis of many superposed cells indeterminate in number, from which the perithecium, the wall-cells of which are few in number and determinate, arises laterally. This type is further distinguished by the production of what at least appear to be definitely differentiated antheridial cells, which are produced much as in *Ecteinomyces* with which it has been provisionally associated above. To this genus from its aquatic habit and parasitism on the Hydrophilidæ I have given the name *Hydrophilomyces*.

Of these groups *Autoicomyces* corresponds in all respects to *Ceratomyces*, except in its determinate perithecium, and is perhaps too closely allied to this genus. There can hardly be a difference of opinion, however, as to the desirability of separating the others.

Emended as above indicated, the genus *Ceratomyces* may be characterized as follows:

Receptacle consisting of three superposed cells above the foot, surmounted by a pair of cells which form the bases of the perithecium and of the appendage respectively. Cells of the perithecial wall-rows indeterminate, both in different species and individuals: perithecium usually appendiculate below the tip. Primary appendage consisting of a variably developed series of superposed cells, the lower members of which may become longitudinally divided, and some or all of which may bear secondary branched appendages arising from cells separated from their upper inner angles.

This is a typically American genus, all the species of which, with the exception of the doubtful *C. terrestris* found on *Lathrobium*, occur on species of the single hydrophilid genus *Tropisternus* and the allied *Pleurohomus* in North and South America. The species vary very greatly in the number of members which compose the rows of wall-cells in the perithecia, the extremes in this respect being well illustrated by *C. procerus*, in which there may be over sixty, and *C. minisculus* in which there are hardly more than a dozen. This variability is not only striking as between species, but the number in different individuals of a given species is by no means constant and may be very variable. All the species with the exception of the anomalous *C. terrestris* to which reference has been made above, and *C. filiformis*, are characterized by the possession of a subterminal perithecial appendage variably developed.

CERATOMYCES FILIFORMIS Thaxter.

This species which usually occurs among the bristles along the margins of the elytra of its host near the tip, is also found not infrequently between the terminal claws of the posterior leg. Material has been examined from Eustis, Florida and specimens have been obtained from Mexican *Tropisterni* in the Paris Museum, No. 50; and on *Pleurohomus obscurus* Sharp from Dueña, Guatemala; Sharp Collection, No. 1185. It is somewhat anomalous and less well marked than any of the other species, seldom shows the presence of branches on its appendage, produces very few spores and varies greatly in the length of its perithecium and in the numbers of cells which compose it.

CERATOMYCES PROCERUS Thaxter. Plate LXIX, fig. 6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 43. June, 1901.

Rather pale amber-brown. Perithecium very elongate, of nearly equal diameter throughout, the wall-cells in each row more than sixty in number; the conformation at the tip similar to that in *C. con-*

fusus; the perithecial appendage erect, short and stout, consisting of about ten cells, distally curved outward, tapering from its broad base to the bluntly pointed tip. Appendages (broken) and receptacle, much as in *C. confusus*. Perithecium 800–850 × 65 μ, its appendage 125 μ. Total length to tip of perithecium more than one millimeter.

On the inferior surface of the abdomen (near the middle) of *Tropisternus* sp. San Fidelio, Brazil. Museum of Comparative Zoölogy, Cambridge, No. 1338.

This species is remarkable for its great length and large size, the number of cells in each cell-row of the perithecium being greater than in any other species. In general habit it resembles *C. filiformis* but differs in possessing a perithecial appendage.

Ceratomyces curvatus Thaxter. Plate LXIX, fig. 1.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 43. June, 1901.

Amber-brown. Perithecium relatively large, inflated toward the base; the distal half up to the perithecial appendage of about equal diameter throughout; about forty cells, more or less, in each row of wall-cells; the configuration at the tip very similar to that in *C. confusus*, the tip itself more prominent, the apex more pointed; the perithecial appendage about nine-celled, the distal half pale, curved or recurved, broader below, shorter and stouter. Receptacle much as in *C. confusus*, the basal cell black, the further suffusion somewhat less extensive. Appendage consisting of about six or seven cells, tapering distally, rather short. Spores about 70 × 4 μ. Perithecia 500–615 × 75 μ (below) × 60 μ (distally), the appendage 150 μ. Total length to tip of perithecium 600–700 μ, to tip of antheridial appendage about 250 μ.

On *Tropisternus Caracinus* N. on inferior surface of abdomen near the tip. Caracas? Berlin Museum, No. 1057.

Although one of the very largest of the genus, this species is not distinguished by any very striking peculiarities. The perithecial appendage is of an unusual form and the perithecium itself is enormous. It appears to be allied to *C. procerus* and *C. confusus*.

Ceratomyces cladophorus Thaxter. Plate LXIX, fig. 2.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 444. April, 1900.

Perithecium very large with a slightly sigmoid curvature, the lower half conspicuously inflated above the rather narrow base, the outer margin of the inflated portion strongly convex, the inner slightly concave; the distal half or third more nearly isodiametric, bulging subterminally on the inner side, the margin curving thence abruptly outward to the short broad beak-like tip; the apex sometimes apiculate; about the fortieth cell of the outer row of wall-cells forming the base of a subterminal appendage which is curved upward, geniculate at its base, rather long slender and tapering, amber-brown becoming blackish below; the perithecium at first pale yellowish, the inflated portion becoming rich amber-brown, the distal portion much paler except in the region of the more deeply suffused subterminal elevation on the inner side. The narrowed base nearly hyaline, not differentiated from the receptacle. Receptacle consisting of three superposed cells, short, narrow below, abruptly very broad above; the foot relatively small, the basal cell small, at first hyaline, later becoming tinged with smoky brown; the two distal cells relatively very small and broadly blackened except along the nearly hyaline anterior margin, the opaque area extending obliquely so as to involve the geniculate base of the appendage. Appendage relatively very large and stout, tapering in very young individuals to a slender apex and consisting of from fifteen to twenty superposed cells, many of which may be once longitudinally divided, a subtriangular appendiculate cell being separated from the inner side, or also from the outer distally; the branches numerous, with very long and slender branchlets which may be several times branched. Spores 95 × 4 μ. Perithecia 475–550 × 90–110 (inflated portion) × 70 μ (distal portion). Receptacle including foot 85 μ. Total length to tip of perithecium (longest) 635 μ. Appendage 275–475 × 45 μ, its longest branches 550 × 3 μ.

On *Tropisternus nimbatus* Say. Eustis, Florida. On the inferior surface of the thorax on the left side.

This fine and very distinct species has been seen on two specimens, only, of its host, taken in Lake Eustis. It is distinguished by the great size of its perithecium, and especially of its primary appendage, the branches of which are more numerous than those of any other species. It sigmoid curvature and pale color serve further to distinguish it.

CERATOMYCES BRAZILIENSIS Thaxter. Plate LXX, fig. 2.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 44. June, 1901.

Dark amber-brown. Perithecium somewhat inflated just above the constricted base, the upper two-thirds broad and of about the same diameter throughout; about forty-five wall-cells in each row, the tip small, short, rather narrow, abruptly hunched externally, the hyaline lips turned abruptly toward the base of the perithecial appendage, which consists of a basal cell hardly differentiated from the wall-cell below it, though somewhat longer, the portion above it erect, slender, stiff, slightly curved outward, tapering but little, the subbasal cell bearing a characteristic basal enlargement which projects toward the lip-cells and lies just above them. The appendage and receptacle much as in *C. mirabilis*. Perithecium 650 × 95 μ (basal) × 87 μ (distal). Appendage 185 μ, or more. Total length to tip of perithecium 800 μ.

On inferior thorax of *Tropisternus nitens* Cast. var. Rio de Janeiro. Sharp Collection, No. 1181.

This is decidedly the largest species of the genus, with the possible exception of *C. curvatus*, and is readily distinguished by the conformation of its tip, which resembles that of *C. Mexicanus*, and by the blunt projection from the base of the perithecial appendage just opposite the apex of the perithecium.

CERATOMYCES CALIFORNICUS Thaxter. Plate LXVIII, figs. 6–7.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 448. April, 1900.

Amber-brown. Receptacle relatively slender, consisting of three small superposed cells surmounted by two similar cells which form the base of the appendage and perithecium; the foot small, normal. Perithecium short and stout, from two to three times as broad distally as at the base; about twenty cells in each of the inner rows of wall-cells, the inner margin convex, distally abruptly bent inward to the short beak-like apex, so that the inner margin of the tip is thus horizontal, or even oblique, above the apex; about the eighteenth cell of one of the outer rows forming the base of the usually straight rather remotely septate perithecial appendage, which commonly diverges at an angle of forty-five degrees or even at right angles. Appendage small and slender (the extremities broken in the types) becoming lateral in position. Perithecia 185–200 × (base) 30–40, (distal portion) 70–85 μ. Receptacle 50–70 × 25 μ. Total length to tip of perithecium 250–300 μ.

On the left anterior inferior angle of the prothorax of *Tropisternus dorsalis* Brullé, California, and in the same position on *T. glaber* Herbst., from Cape Neddock, Maine (Bullard).

The single specimen of this species found by Mr. Bullard does not differ from the Californian material, and the species may prove to be not uncommon in the East, if looked for in the position indicated. It is closely allied to *C. camptosporus*, but differs in its considerably smaller size, in the character and suffusion of its foot and receptacle, in the antheridial appendage which lacks the characteristically enlarged subbasal cell and also in other minor points.

CERATOMYCES CAMPTOSPORUS Thaxter.

Further material of this rare species has been obtained from various localities in New England, and also on *Tropisternus limbalis* Lec., from Washington; *T. striolatus* Lec. from Texas, and *T. lateralis* Fabr. from Eustis, Florida. It is a well marked and constant form, closely allied to *C. Californicus*, but readily distinguished by its foot and appendage, as well as by its greater size.

CERATOMYCES MEXICANUS Thaxter. Plate LXX, fig. 3.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 43. June, 1901.

Dark amber-brown. Perithecium with a slight submedian inflation; distally broad, the outer margin turning abruptly inward distally to the inconspicuous retracted tip, which lies close at the base of the perithecial appendage, and is externally subtended by irregular inconspicuous papillate protrusions: the basal cell of the appendage slightly divergent several times as long as broad; the external margin straight, the inner strongly concave with a median blackish suffusion; the rest of the appendage slightly curved, about eight or nine-celled, tapering slightly and diverging strongly above the basal cell. The antheridial appendage and the receptacle much as in *C. mirabilis.* Spores 85 × 5 μ. Perithecia 400–475 × 110–125 μ, the appendage about 290 μ, its basal cell 70 × 26 and 36 μ. Total length to tip of perithecium 550–640 μ.

On the left inferior margin of the abdomen of *Tropisternus nitidus* Sharp, Sharp Collection, No. 1177, and of *T. chalybeus* Cast., British Museum, No. 772, Oaxaca, Mexico.

The conformation of the tip of the perithecium in this species is not unlike that of *C. Californicus* and *C. Braziliensis,* but it is readily distinguished by its long geniculate appendage, large size and dark color. It is most nearly related to *C. Braziliensis* and to *C. mirabilis.*

CERATOMYCES MIRABILIS Thaxter.

Additional material of this common and widely distributed species has been examined from the following sources. Paris Museum on *Tropisternus* sp., South America, Nos. 4a and 48; No. 50 from Mexico. Berlin Museum No. 1056 on *T. "umbrinus"*, Para. Dr. Sharp's Collection No. 1180 on *T. nitens* Cost., Cayenne; No. 1182 on *T. ebenus,* Rio de Janeiro; No. 1183 on *T. nigrinus* Sharp, Brazil; No. 1184 on *T. lateralis* Fabr., Brazil; No. 1186 on *T. xanthopus* Sharp, Mexico; No. 1185 on *Pleurohomus obscurus* Sharp, Dueñas, Guatemala. On *Tropisternus* sp. San Fidelio, Brazil and Eustis, Florida. The characters of the species appear to be decidedly constant and it is most readily distinguished by the external hunch which subtends the tip of the perithecium, and is usually bent in against the base of the appendage.

CERATOMYCES CONFUSUS Thaxter.

This species which is closely allied to *C. mirabilis,* although much rarer, seems to be quite constant in its characters. It usually occurs near the tip of the abdomen on its right inferior margin. It has been found again on several *Tropisterni* in Lake Eustis, Florida.

Ceratomyces ansatus nov. sp. Plate LXIX, figs. 4–5.

Perithecium in general resembling that of *C. confusus,* larger, the anterior and posterior rows of wall-cells consisting of about thirty-five cells, the anterior forming a slight ridge below the tip on the left side; the free tip shorter more broadly papillate, the perithecial appendage stouter, conspicuously inflated above its base, erect; the distal portion more or less strongly curved outward and sometimes ending in a few fine hyaline branches; the whole often sickle-shaped, its basal cell more or less opaque strongly concave on its inner side. Receptacle as in *C. confusus,* but the blackened portion extending up beyond the base of the appendage and forming a free finger-like distally rounded projection, the appendage set between this and the base of the perithecium as in a socket. Appendage relatively small and narrow, usually short and terminated by a tuft of slender hyaline branchlets. Total length to tip of perithecium 425–475 μ. Perithecium to tip 325–350 × 75–80 μ, its appendage 220 × 36 μ. Receptacle to tip of its projection and including foot 175–200 μ.

On *Tropisternus* sp., Museum of Comp. Zool., No. 1336 (Type) San Fidelio, Brazil. On *T. striolatus* Lec., Eustis, Florida.

This species which is closely allied to *C. confusus* and *C. Floridanus,* appears to be characteristic of the striped *Tropisterni,* and is found on the inferior surface of the abdomen on the left side. It seems to differ from its nearest ally, *C. confusus*, in the different conformation of the papillate apex of its perithecium, the tip of which is smaller and less prominent, in the even inflation and dark basal suffusion of the perithecial appendage and in the character of its antheridial appendage; but especially in the finger-like protrusion of its receptacle which, although it varies somewhat in length in different individuals, is very characteristic. The species appears to be rather rare, only a very small number of the very numerous hosts examined from Eustis being parasitized. Fig. 4 represents the Type from Brazil and fig. 5 a specimen from Eustis.

CERATOMYCES FLORIDANUS Thaxter. Plate LXX, fig. 4.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 444. April, 1900.

Purplish brown. Perithecium much as in *C. confusus*, the outer margin nearly straight, the inner somewhat convex, the lateral and posterior rows of wall-cells, about twenty-four in number, rich red-brown with a blackish tinge distally; the anterior wall-cells, about nineteen in number below the perithecial appendage abruptly and evenly paler, yellowish straw-color or faintly brownish; the twentieth cell (about) forming the base of the perithecial appendage which is black, quite opaque, curved outward and upward and geniculate near its base, the inner margin of which is abruptly distinguished (not continuous with the adjacent margin of the tip as in *C. confusus*); the tip distally hyaline, the apex forming a prominent symmetrical well defined rounded hyaline papilla. Receptacle marked by fine longitudinal striations consisting of three superposed cells almost wholly black and opaque except along their anterior margins and the distal margin of the upper cell, which are pale straw-yellow or amber-colored, the series surmounted by two small flattened cells from which arise the perithecium and appendage respectively. Appendage long tapering, consisting of seven or eight superposed cells, clear reddish brown with a blackish tinge, the inner margin as well as the distal portion yellowish or amber-colored. Perithecia 300–325 × 60 μ, the appendage 150 μ. Receptacle 150–160 × 75 μ. Appendage about 175–200 μ.

On the margin of left elytron of *Tropisternus glaber* Hb. (?), Eustis, Florida, October.

Although this species is closely allied to *C. confusus* it may be readily distinguished by its perithecial and antheridial appendages, the latter characteristic in appearance, abruptly distinguished and contrasting black, the former straight stout, rigid, with much larger basal cells, and deep external suffusions. There is moreover a peculiar semi-olive caste to the deeper suffusions, which is not present in other species. The receptacle, like that of *C. spinigerus*, is marked by fine longitudinal striations, which are only visible in the translucent portion. There may perhaps be some doubt as to the determination of the host which is not certainly *T. glaber*, though very similar to that species.

CERATOMYCES SPINIGERUS Thaxter. Plate LXX, figs. 5–6.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 42. June, 1901.

Bright amber-brown. Perithecium paler anteriorly, about twenty-eight wall-cells in each row; narrower at the base, the lower half bulging anteriorly, tapering distally where it is rather strongly curved away from the antheridial appendage: the tip hyaline, prominent, obtuse, about half as long as the curved tooth- or spine-like one-celled deep amber-brown appendage, which arises below and beside it. Basal cell of the receptacle large, long, mostly curved, broader distally, opaque; the portion above it relatively small and narrow, concolorous with the perithecium the upper cells marked by fine parallel longitudinal striations. The appendage erect, slightly divergent, stiff, long, slender, rather remotely septate, but the basal cell often broader than long, about seven-celled, tapering distally. Spores 90 × 4 μ, in one small specimen 165 × 4.5 μ. Perithecia 425–500 × 70–95 μ, the appendage 45–50 μ. Receptacle 175–220 μ, the basal cell 150–170 μ. Antheridial appendage 200–325 μ.

On the inferior anterior margin of the thorax near the base of the right elytron of *Tropisternus apicipalpis* Cast., Jalapa, Mexico. Sharp Collection, No. 1178.

A very beautiful species abundantly distinguished by reason of its many peculiarities from all others. It is perhaps more nearly allied to *C. Floridanus* than to any other and has the same peculiar longitudinal striations on the cells of its receptacle. Its clear amber-color is also peculiar. The occurrence of monstrous spores in one smaller specimen is noted above, and illustrates the danger of ascribing too much importance even to considerable variations in spore measurements.

CERATOMYCES MINISCULUS Thaxter.

This species which always grows on the pale lower margin of the right elytron, has been found on *Tropisternus striolatus* Lec. and *T. lateralis* Fabr., at Eustis, Florida; on *T. limbalis* Lec. from Washington; on *T. dorsalis* Brullé from California. In the Sharp Collection from Brazil on *T. lateralis*, No. 1184; and in the Museum of Comp. Zool., No. 1337, on an undetermined *Tropisternus* from Brazil. It is always readily distinguished by its small size, and almost wholly opaque receptacle.

COREOMYCES Thaxter. LXXI. 7-18

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 56. June, 1902.

Mature individual consisting of a single series of superposed cells terminated by a single perithecium. Receptacle attached by a more or less rhizoid-like foot and consisting of three superposed cells, the upper of which becomes divided distally by successive transverse septa; these divisions resulting in a series of superposed cells, from each of which arises, on one side, a single, rarely two, branched antheridial, appendages; the members of the series thus resulting being superposed in a single vertical row. Perithecium consisting of an undifferentiated stalk-cell immediately above the appendiculate cells, which is followed directly by the ascigerous cavity, the basal and wall-cells being wholly obliterated in mature individuals, except at the tip.

The development of the individuals in this type is unlike that found elsewhere in the Laboulbeniales. The young individual, Plate LXXI, figs. 8 and 17, consists of a series of superposed cells, three in number, from the uppermost of which appendiculate cells are separated distally. The distal portion of the individual above these appendiculate cells, of which there may be one to several, consists of a simple series of from four to six superposed cells, terminated by a simple or branched erect appendage which might be taken for a trichogyne, but is merely a sterile termination. There are thus three regions, a basal, a distal and a middle region, of which the first forms the receptacle proper, the second produces the perithecium, and the middle gives rise to the antheridial appendages; an arrangement quite unlike that seen in any other instance. As the individual continues to develop, the subbasal cell of the distal series, which is finally quite obliterated, becomes proliferous distally, sending branches into the cavity of the cell immediately above it (fig. 9). At about this time the sterile terminal appendage already referred to, is broken or sloughed off. The penetrating branches are apparently primarily two in number, their bases, it would appear, corresponding to the "posterior basal cell" and the "secondary stalk-cell" of the perithecia of *Laboulbenia* and other genera, as described in my Monograph, pp. 219 and 232, Plate II, figs. 16–18, cells (o) and (h), which in these cases arise as branches from the stalk-cell (p). The further development appears also to correspond with that of the ordinary type of perthecium, in that these two cells give rise to a series of branches from which wall-cells, parietal cells, and procarp cells are formed.

Of the two original cells one, Fig. 12, (o), as in other cases, appears to form only one series of wall-cells and one of parietal cells; in other words it appears to branch only once, while all the rest of the essential cells of the perithecium and procarp are derived from three branches which arise from the second cell (h). As these branches develop, they penetrate and destroy the successive septa which separate the cells above, of which there may be from two to four; and finally the procarpic branch, reaching the tip of the terminal cell before the others, perforates it at a point corresponding to the base of the terminal sterile appendage above mentioned, and emerging forms the short irregularly branched trichogyne shown in figs. 11–12. I have found it impracticable to draw the exact conditions seen by focussing upon this plexus of penetrating branches and the figures given (figs. 11–12) represent only the structures seen in a single plane. In fig. 12 for example the branches are represented in a position a little below the median plane, and other branches coming from cell (h) both above and below, are not shown. The parietal branches appear to be developed near the bases of the wall-cell branches, but are small and hardly distinguishable, their functions being usurped as will appear later, by the wall-cells themselves.

Even while this development of branches is taking place the two basal cells (o) and (h) begin to be pressed down by the structures to which they have given origin above, into the cell below from which they originated, and as the development of the ascogonium proceeds this cell, like the cells above it, loses its identity as a cell; the whole series being transformed to a continuous cavity within which the whole ascogenic apparatus eventually lies quite free. The procarp resembles other procarps of this group, consisting of an ascogonium, an inferior and a superior supporting cell, followed by a trichophoric cell; above which the unicellular, sparingly branched or lobulated trichogyne emerges, as has been already described (figs. 11–12). As the perithecium matures and the ascogenic cells become active, only two or three wall-cells which have become indurated and cohere closely to the inner surfaces of the cells within which they were formed, persist, as shown in the bent termination of fig. 7, to form the tip of the functional perithecium. The cavity of the perithecium is thus the cavity of the cell from which the perithecial branch system originated combined with the cavities of the cells through which these branches penetrated; and its walls, except at the tip, as above mentioned, are the walls of these cells. The structure may thus be termed a *pseudoperithecium.*

If then one examines the conditions found when the plant is fully mature it will be seen to consist of the same three regions distinguished in the young condition. The terminal region, however, above the appendiculate cells, excepting only its basal cell which acts as a false stalk-cell to the pseudoperithecium, has become transformed into a single chamber, the wall of which corresponds to the combined walls of the four or more cells which were superposed above the basal cell of the series comprising this distal region. Within this chamber have developed from the subbasal cell of the series, structures which correspond to *all* those found in the normal perithecium of the Laboulbeniales. Of these structures, however, all are eventually disorganized with the exception of a few small wall-cells, which persist distally and are functional in regulating the spore-discharge, and the ascogenic cells, of which there appear to be four. These ascogenic cells, then, together with the usual mass of asci and spores, float free within a structure resembling a perithecium and performing the same function, but which when viewed superficially has absolutely nothing in common with any of the structures seen in perithecia of the normal type.

Such an endogenous origin of the perithecium has no parallel in the other genera, unless it be in *Zodiomyces* and perhaps also in *Euzodiomyces.* In the former the perithecigerous area arises endogenously in a somewhat similar fashion, and if in the present instance the perithecial structures persisted, and the walls of the cells into which they penetrate were eventually destroyed, the conditions would be closely comparable: the differences depending merely on the differences in the general cell structure of the body of the plant in either case; the complicated multicellular body of *Zodiomyces* producing many perithecia where the present simple type gives rise to but one. The character and origin of the antheridial branches in the two cases are however totally different.

The antheridial appendages in the present genus are peculiar, from their position on the primary axis *below* the perithecium, a condition seen nowhere else unless possibly in *Chætomyces;* although such an arrangement, as in *Clematomyces,* is often seen in *branches* from this axis. The antheridial cells themselves are merely the lower cells of the appendage or its branches (fig. 13), from which short outgrowths arise that are converted into discharge-tubes through which the sperm-cells make their exit as in simple antheridia of the ordinary type. The conditions present in the antheridial appendages in this instance do not therefore appear to differ essentially from those seen, for example, in *Rhadinomyces;* except that the series of antheridial cells is not definitely differentiated. At the same time the conditions described are very similar to those in *Rhynchophoromyces* and illustrated in my Monograph, Plate XXIV, fig. 24: but whether the sperm-cells in the present instance possess a wall, as in *Rhynchophoromyces,* I am not able to say. The antheridial characters of *Corcomyces* thus tend to break down the distinction formerly assumed to exist between the Exogenæ and the Endogenæ, from the fact that a discharge tube is developed and that the sperm cells appear to be quite free at the moment of exit, not remaining attached or cohering as they occasionally do in *Rhynchophoromyces*. Although in *Ceratomyces* and *Autoicomyces* the sperm cells appear to be segments of actual branchlets, and in *Zodiomyces* they arise, if my former observations are correct, by exogenous budding as in the spermatia of many lichens, it is evident from these intermediate conditions, that no hard and fast line can be drawn between the two types of origin.

The species occur on water bugs, Corisidæ, (often written Corixidae), and are the only forms known to be parasitic on hemipterous insects. The discovery of this very interesting genus is due to Mr. Charles Bullard who first observed it on *Corisæ* from the Cambridge region.

COREOMYCES CORISÆ Thaxter. Plate LXXI, figs. 16–18.

Proc. Am. Acad. Arts and Sci., Vol. XXXVIII, p. 56. June, 1902.

Curved or straight, pale dull brownish, nearly transparent. Cells of the receptacle distinguished by more or less distinct constrictions, the three lower somewhat variable in length, the basal smaller, usually tapering somewhat to the foot; the subbasal larger than either of the others, more or less inflated, often as broad as the perithecium; the upper cell somewhat narrower, followed by the two to four, usually flattened, appendiculate cells, which are successively longer, though usually slightly narrow from below upward, the uppermost becoming about half as long as broad. The appendages long slender hyaline, sparingly branched, slightly divergent; usually extending upward to, or considerably beyond, the tip of the perithecium. Stalk-cell of the perithecium not differentiated from the cells below it, large, as broad as the body of the perithecium above it, cylindrical or slightly inflated, about as long as broad or slightly longer: body of the perithecium usually straight, somewhat darker dull brown, especially where it tapers rather gradually to the small tip which becomes distinctly symmetrically four-papillate, and is usually slightly bent to one side. Spores 85 × 6 μ. Perithecia 100–110 × 25–35 μ, the stalk-cell 30–33 × 32–35 μ. Receptacle, exclusive of the appendiculate cells, 75–100 μ. Appendages 200–250 μ. Total length to tip of perithecium 275–290 μ.

On inferior surface of abdomen of *Corisa Kennicottii* Uhler, Arlington (Bullard), on *Corisa* sp., Iowa, and on two species of the same genus collected near Fresh Pond, Cambridge.

This species, which sometimes occurs in company with *C. curvatus* on the same individual, is always found on the abdomen, usually near its extremity, on the under side. In a single instance a group of individuals was found on the upper margin of one of the anal plates which differ in several respects from the type form, having as many as seven appendiculate cells, a more elongate form and other slight differences which may prove of specific value. The material from Iowa corresponds in all respects with the ordinary type found about Cambridge. The name of the host-genus is sometimes written *Corixa*.

COREOMYCES CURVATUS Thaxter. Plate LXXI, figs. 7–15.

Proc. Am. Acad. Arts and Sci., Vol. XLI, p. 318. July, 1905.

Nearly hyaline, or but faintly tinged with brownish. Receptacle becoming narrow toward the small basal cell, the two cells above the latter subequal in length, the appendiculate cells usually four, broader than long, subequal or the lower shorter. Stalk-cell of the perithecium relatively long, slightly or not at all inflated; the base of the perithecium often slightly inflated, the upper third or more bent abruptly outward, tapering to the blunt curved apex, the concave side of which is edged with amber-brown, the convex marked by slight indentations due to the prominence of the persistent wall-cells in this region. Appendages as in *L. Corisæ*, usually distinctly shorter. Spores 55 × 4 μ. Perithecium 130–140 × 36 μ, its stalk-cell 70 × 25 μ. Total length, average, about 350–360 μ. Appendages about 125 μ.

On under side of margin of left elytron of two species of *Corisa*. Near Fresh Pond, Cambridge.

Sufficient material of this form has been obtained on *Corisæ* from an old clay pit near Fresh Pond, to determine the constancy of its characters. Its occurrence on the left elytron appears to be invariable.

Zodiomyces vorticellarius Thaxter.

I. p.369

This species has been again found on Hydrophilidæ from Lake Eustis and Cocoanut Grove, Florida, and enormous individuals, some of them three millimeters in length, were obtained in the Paris Museum, No. 121, on a large species of *Hydrophilus* from Rosario, Argentina. Despite the size of the receptacles in these individuals, the perithecia and other structures seem identical with the smaller forms, and certainly cannot be separated specifically.

EUZODIOMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 449. April, 1900.

Receptacle elongate, multicellular, terminated by a primary branched appendage, and consisting of a large and indefinite number of superposed cells which distally become divided longitudinally to form successive tiers of cells which become proliferous on one side and give rise to a unilateral series of perithecia and sterile (and antheridial ?) appendages. Perithecia having nine or ten wall-cells in each row and borne on two superposed cells which form a stalk.

The material illustrating this very peculiar genus is for the most part in very poor condition, and includes but one mature individual. The appendages and young perithecia are so matted together that I have found it impossible to determine accurately the character of the antheridial branchlets. In a few cases flask-shaped cells have been observed which are borne one to three together on short branches. Whether these are really antheridia, however, can only be determined by the examination of fresh material.

The genus is most nearly allied to *Zodiomyces* and to *Kainomyces*, the short stout blunt and very peculiar perithecium suggesting that of *Kainomyces*, while its two-celled stalk is similar to that of *Zodiomyces*. The receptacle ends in a primary appendage which bears a number of filamentous branches, and below its base the perithecigerous area extends downward on one side for a variable distance. Whether this perithecigerous region originates endogenously, as in *Zodiomyces*, I have been unable to determine from the material available; but such does not appear to be the case. The elements arising from this region, however, consist of sterile rarely branched filamentous appendages which form a double row enclosing the other structures within, somewhat in the same manner that the circular series in *Zodiomyces* encloses the region from which the perithecia and antheridial appendages arise. The strobil-like perithecium is quite unique and no lip-cells appear to be differentiated. In some specimens the receptacle is very slender while in others it may be stout and densely cellular.

The species does not appear to occur in America, but seems to be not uncommon in England where it is to be hoped that fresh material may be obtained, and more thoroughly investigated.

Euzodiomyces Lathrobii Thaxter. Plate LXXI, fig. 23.

Proc. Am. Acad. Arts and Sci., Vol. XXXV, p. 449. April, 1900.

Hyaline or faintly yellowish. Receptacle long and slender, or shorter and stouter, according as the longitudinal septa are few or abundant; the superposed cells and those composing the tiers sometimes nearly a hundred in number, the upper half or more producing a unilateral series of perithecia and appendages. Perithecia distinctly broader distally, the fourth or the fifth to the seventh wall-cells inclusive, of each row, growing upward and outward to form well developed prominences, giving the margin on either side in this region a bluntly serrate appearance; the lip-cells arched, forming a characteristic broad dome-like apex; the lower stalk-cell small, the upper much larger, stout somewhat inflated and nearly as broad as the base of the perithecium. Appendages long slender cylindrical, simple or sparingly branched, flexuous. Perithecia 75 × 28–30 μ (including projections), stalk about 40 μ, the upper cell about 22 × 14 μ. Total length of receptacle 200–475 × 25–70 μ. Appendages 125–230 × 4 μ.

On *Lathrobium punctatum* Zett., British Museum No. 442, Notting Hill, England; on *L. multipunctatum* Grev., British Museum No. 429, Europe; on *L. filiforme* Grav. British Museum No. 443, Notting Hill, England; on *L. brunneipes* Fab., Thornhill, England. Sharp Collection, No. 1144.

KAINOMYCES Thaxter.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 44. June, 1901.

Receptacle broad and flattened; consisting of a single basal cell and typical foot, above which the successive cells become variably divided by longitudinal septa into transverse cell-rows or tiers: a distal appendiculate portion more or less definitely distinguished and consisting of superposed cells, the lowest of which alone become longitudinally divided, all producing laterally antheridial (?) branches: several of the tiers below this appendiculate portion growing out laterally at right angles to the main axis of the receptacle, on one or both sides, to form indeterminate perithecial branches consisting of superposed cells and terminated by solitary perithecia. The perithecium of peculiar form, with six wall-cells in each row in addition to the lip-cells; the base of the trichogyne persistent in the form of a conical projection, associated in the type with a peculiar appendage inserted close beside it and shaped like a duck's bill.

It has proved impossible from an examination of the material available of this extraordinary form, to determine the character of the antheridia; and it is therefore placed provisionally near *Zodiomyces* and *Euzodiomyces*, although the resemblance which the single species bears to these genera may prove a superficial one. The distal appendiculate portion of the receptacle resembles the corresponding structure in the species of the two last mentioned genera as well as the so-called main appendage of *Ceratomyces* and its nearest allies. A similar comparison might also be made with the appendage of *Sphaleromyces* and its allies which, however, differ in possessing a few-celled receptacle.

The perithecia in the Type are extremely peculiar, both from their form and their two curious appendages, the smaller of which is evidently the indurated base of the trichogyne, and on account of their short stout form and the numerous members which compose the rows of wall-cells. The indeterminate cellular stalks of the perithecia have no parallel in any other genus, and although they may be called fertile branches, appear to represent stalk-cells which are distally subject to active intercalary division. How such a modification should be of advantage, it is difficult to see, since the growth of this branch carries the trichogyne far away from the assumed region of sperm-cell formation. The fact that the perithecia appear frequently to abort owing to lack of fertilization, would indicate that this relation is on the contrary a disadvantage as compared with the conditions usually observed, in which the trichogyne is closely associated with the sperm-cell producing structures.

KAINOMYCES ISOMALI Thaxter. Plate LXXI, figs. 20–22.

Proc. Am. Acad. Arts and Sci., Vol. XXXVII, p. 45. June, 1901.

Receptacle variably developed below the distal appendiculate portion, sometimes very broad, often much narrower: the cells above the basal cell becoming broader and flattened, and soon divided longitudinally by one or more septa, nearly hyaline and broadly edged wholly or in part below, especially on the posterior side, with contrasting brownish black, which may involve the whole of the cell, except the transverse septa; the blackened area usually characteristically indented above, and sometimes involving all but the uppermost tiers. Perithecial branches variably developed, the free portion curving upward, and consisting of from about twelve to thirty-five superposed hyaline cells, which are more or less flattened, usually separated by slight constrictions, the distal one similar to the others and followed directly by the basal cells of the perithecium. Perithecium becoming tinged with pale amber-brown, usually short, stout and broadly elliptical, often not distinguished from its basal cells; the distal end abruptly rounded, the pore subtended by a tooth-like outgrowth, the persistent base of the trichogyne, half as long as and paler than an appendage beside it, which bears a slight resemblance to a duck's bill, is dark clear brown, somewhat narrower distally and pale tipped, broader toward the base, where it is abruptly constricted and hyaline. Spores about 30 × 3.5 μ. Perithecia 72–80 × 40–50 μ exclusive of trichogynic appendage, which measures 28–32 × 11 μ. Perithecial branch 100–253 μ. Receptacle 150–220 × 40–60 μ. Antheridial branches about 50 μ. Total length to tip of perithecium 250–460 μ.

On *Isomalus Conradti* Fauvel. Derema, Usambara, East Africa. Berlin Museum, Nos. 847–848.

The appendages of this remarkable form are more or less matted and broken in the types which were obtained from pinned hosts that had apparently been in alcohol. The receptacle is very similar to that of *Zodiomyces*, and varies considerably both in the number of tiers, and in the number of cells in each tier, especially in the upper ones. The number of perithecia produced is also very variable, and in a few specimens these are formed on both sides, projecting in opposite directions. The transverse blackened areas, usually conspicuous and contrasting across the lower tiers which they may even involve completely, and which are peculiar for the indentations of their upper margins (fig. 20), also vary considerably, as is indicated in the accompanying figures. The host is a very insignificant staphylinid, which apparently lives under bark and would hardly have been suspected of harboring so large and peculiar a form.

ERRATA.

p. 269, line 5, for H. read M.

p. 276, line 6, for Catoscopi read Catascopi.

p. 314, line 12, for 13 read 14.

p. 332, line 35, for Dohrini read Dohrni.

p. 334, line 6 from bottom, for Microxys read Micrixys.

p. 342, line 24, for Calarhoides read calathoides, line 17, for Nitobia read Notiobia.

p. 345, line 44, for Fairmaeri read Fairmairei; line 36, for Eberi read Erberi; last line, for punicatus read pumicatus.

p. 354, line 6 from bottom, for furcipes read fuscipes.

The following Errata in Part I of this Monograph (Memoirs, Vol. XII, No. 3), have been brought to my attention:

p. 267, line 26, for 17 read 18.

p. 269, line 7, from bottom; p. 270, lines 11 and 31; p. 271, line 11; p. 273, line 25; p. 274, line 5,—for Plate V, read Plate VII.

p. 279, line 19, for IV and 11 read VI and 9.

p. 280, line 1, for 8: read VI.

p. 289, line 10 from bottom, for VII and 27 read VIII and 28.

p. 303, line 4 from bottom, for VII read IX.

p. 314, line 10, for I read II.

p. 322, line 19, for Catoscopi read Catascopi.

p. 329, line 1, for XIV read XVI.

p. 339, line 4 from bottom, for McLean read McLeary.

p. 351, line 1, after 4 insert "and 12."

p. 363, line 20, for 15 read 16.

p. 369, line 1, for 19 read 18 and 26.

p. 371, line 27, for 24 read 25.

p. 392, for Catoscopus read Catascopus.

p. 394, line 27, for Catoscopus read Catascopus.

p. 403, after Fig. 17 add Fig. 18, Spore.

p. 408, line 9, for 2a read 6a.

p. 203, line 5, for XXIV read XXIII, and line 10, for 13 read 1.

INDEX.

Since it has been necessary to omit a Host-Index, it has seemed desirable to separate the following Index of Host-Names from the Index of Plant-Names. It should be remarked in this connection that the host-names are those which were found on the labels of the specimens examined and in some cases were evidently unreliable. No attempt has been made to set right the synonymy of the insect-hosts, and the same form will thus be found in certain cases under two generic names. A complete Host-Index, with indications as to the synonymy, will be published at some later date.

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DESCRIPTION OF THE PLATES.

The figures have been reproduced by photo-lithography and somewhat reduced from original ink drawings, the approximate magnifications of which are indicated.

PLATE XXVIII.

Dimeromyces coarctatus Thaxter. **Fig. 1.** Mature female individual with two perithecia, side view, × 600. **Fig. 2.** Mature female individual with one perithecium, the male individual at right, a spore in process of discharge from the apex of the perithecium, × 600. **Fig. 3.** The same, anterior view, × 600. **Fig. 4.** Young female individual, lateral view showing young perithecia at left with terminal trichogyne, × 950. **Fig. 5.** Mature male individual with three antheridia, lateral view, × 1800. **Fig. 17.** Young perithecium with terminal trichogyne on which are two antherozoids, × 1800.

Dimeromyces rhizophorus Thaxter. **Fig. 6.** Mature female individual; posterior view showing furcate rhizoid, × 600. **Fig. 7.** Similar individual partly lateral view showing position *in situ* on small portion of the host integument beneath which the furcate rhizoid extends into its body cavity, × 600. **Fig. 8.** Male individual with three antheridia showing its relation to integument of host, the simple rhizoid lying wholly within the body cavity, × 1150.

Dimeromyces Forficulæ Thaxter. **Fig. 9.** Mature female individual with a male at right showing relative position on the integument of host, × 600. **Fig. 10.** Mature female individual; lateral view, × 600. **Fig. 11.** Mature male showing relation to basal cell of female at right, × 1150.

Dimorphomyces Thlcoporæ Thaxter. **Fig. 12.** Female individual with male at right. **Fig. 13.** Distal portions of female (left) and male receptacles.

Dimorphomyces Myrmedoniæ Thaxter. **Fig. 14.** Female individual with five perithecia seen from above (in relation to position of growth on host), × 600. **Fig. 15.** Similar individual seen from below, × 600. **Fig. 16.** Male individual, × 950.

PLATE XXIX.

Dimeromyces Labiæ Thaxter. **Figs. 1–3.** Three female individuals seen from different positions, × 600. **Fig. 4.** Female individual more highly magnified, × 1150. **Fig. 5.** Male individual with three antheridia, × 1150.

Dimeromyces minutissimus Thaxter. **Fig. 6.** Mature female individual more highly magnified, × 1150. **Figs. 7–8.** Mature female individuals, × 600. **Fig. 9.** Mature male individual, × 1800.

Dimeromyces nanomasculus Thaxter. **Fig. 10.** Mature female individual, × 600. **Figs. 11–12.** Female individual with a male individual (fig. 12) *in situ* at its base, × 600. **Fig. 13.** Mature male individual × 1800.

Dimeromyces crispatus Thaxter. **Fig. 14.** Mature female individual with male *in situ* on the right at its base, × 600. **Fig. 15.** Male individual with the base of female seen at left, × 1150.

Dimeromyces pinnatus Thaxter. **Fig. 16.** Well developed female individual with three perithecia, × 600. Fig. 17. Female individual from leg of host, × 600. **Fig. 18.** Male individual with three antheridia, × 600.

PLATE XXX.

Dichomyces Cafianus Thaxter. **Figs. 1–2.** Posterior and anterior views of mature individuals, × 600.

Dichomyces Peruvianus Thaxter. **Figs. 3–4.** Anterior and posterior views of mature individuals, × 600. **Fig. 5.** Tip of perithecium enlarged, × 1800.

Dichomyces Angolensis Thaxter. **Figs. 6–7.** Posterior and anterior views of mature individuals, × 600.

Peyritschiella protea. Thaxter. **Fig. 8.** Small individual on *Bledius bicornis* (England) × 600. **Fig. 9.** Well developed individual on the same host.

Peyritschiella Amazonica Thaxter. **Fig. 10.** Posterior view of mature individual from Nanta, Amazon, × 600.

Peyritschiella Xanthopygi Thaxter. **Fig. 11.** Anterior view of mature individual, × 600.

PLATE XXXI.

Dichomyces exilis Thaxter. **Figs. 1–2.** Two individuals showing variation in form of perithecia, anterior and posterior views respectively, × 600.

Dichomyces infectus Thaxter. **Figs. 3–4.** Two variations showing anterior and posterior views respectively × 600.

Dichomyces vulgatus Thaxter. **Figs. 5–6.** Anterior views illustrating two types of form, × 600. **Figs. 7–8.** Posterior and anterior views of appendiculate tips of perithecia, × 1800. **Fig. 9.** Anterior view of individual in which the perithecial appendages are absent. An adventitious perithecium developing from the second tier at the left, × 600.

Dichomyces furciferus Thaxter, variety. **Figs. 10–11.** Anterior views of two individuals showing variation. Material from Cambridge, × 600. **Fig. 12.** Posterior view of individual from Abyssinia, × 600.

Dichomyces Homalotæ Thaxter. **Fig. 13.** Anterior view of pale individual, × 600. **Fig. 14.** Posterior view of type form, × 600.

Dichomyces hybridus Thaxter. **Fig. 15.** Anterior view of individual in which the perithecial appendages are absent, × 600. **Fig. 16.** Individual having both types of perithecia, × 600. **Fig. 17.** Posterior view of individual in which the perithecia are all of the appendiculate type, × 600. **Figs. 18–19.** Posterior and anterior views of tips of perithecia of the appendiculate type, × 1800.

PLATE XXXII.

Dichomyces Javanus Thaxter. **Figs. 1–2.** Posterior and anterior views of typical forms, × 600.

Dichomyces insignis Thaxter. **Fig. 3.** Posterior view of well developed individual, × 600. **Fig. 4.** Antheridium much enlarged, × 1800. **Figs. 5–6.** Anterior and posterior views of the appendiculate tips of two perithecia, × 1800.

Dichomyces dubius Thaxter. **Figs. 7–8.** Two individuals with two (posterior view) and four (anterior view) perithecia respectively, × 600. **Figs. 9–10.** Anterior and posterior views of the appendiculate tips of two perithecia, × 1800.

Dichomyces Madagascarensis Thaxter. **Figs. 11–12.** Anterior and posterior views of well developed individuals, × 600. **Fig. 13.** Anterior view of tip of perithecium, × 1800.

Dichomyces bifidus Thaxter. **Fig. 14.** Anterior view of well developed individual, × 600. **Figs. 15–16.** Posterior and anterior views of tips of perithecia, × 1800.

PLATE XXXIII.

Dichomyces biformis Thaxter. **Fig. 1.** Posterior view of well developed individual with seven mature and one immature appendiculate perithecium, × 600. **Fig. 2.** Anterior view of a typical individual with six appendiculate perithecia (England), × 600. **Fig. 3.** Anterior view of individual with perithecia of the second type bearing no appendages, × 600. **Figs. 4–5.** Posterior and anterior views of tips of appendiculate perithecia, × 1800.

Dichomyces Belonychi Thaxter. **Figs. 6–7.** Two individuals, posterior and anterior views respectively, × 600. **Figs. 8–9.** Posterior and anterior views of the tips of appendiculate perithecia × 1800.

Dichomyces Australiensis Thaxter. **Figs. 10–11.** Two individuals, posterior and anterior views respectively, × 600. **Figs. 12–13.** Anterior and posterior views of appendiculate tips of perithecia. × 1800.

Dichomyces Mexicanus Thaxter. **Figs. 14–15.** Two individuals anterior and posterior views respectively, × 600. **Figs. 16–17.** Posterior and anterior views of appendiculate tips of perithecia, × 1800.

PLATE XXXIV.

Rickia Wasmanni ~~Berlese~~ Cavara. **Figs. 1–9.** Successive stages in the development of young individuals, × 1100. **Fig. 10.** Mature individual, × 290. **Fig. 11.** Mature individual more highly magnified, × 600. **Figs. 12–13.** Antheridia illustrating compound character, × 1400.

Limnaiomyces Tropisterni Thaxter. **Figs. 14–15.** Mature individuals. The pointed antheridium is shown at the left in fig. 5 just below the base of the perithecium, × 290.

Limnaiomyces Hydrocharis Thaxter. **Figs. 16–17.** Two mature individuals, × 290. **Figs. 18.** Young individual; the young antheridium at x, × 600.

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Chitonomyces psittacopsis Thaxter. **Figs. 23–24.** Two mature individuals, × 290. **Fig. 25.** Tip of perithecium more highly magnified, × 600.

Chitonomyces dentiferus Thaxter. **Figs. 26–27.** Two mature individuals seen from opposite sides, × 290 and 600.

Chitonomyces Hydropori Thaxter. **Fig. 28.** Mature individual, × 290. **Fig. 29.** Mature individual more highly magnified, × 600.

Chitonomyces occultus Thaxter. **Fig. 30.** Mature individual, × 290. **Fig. 31.** Mature individual more highly magnified, × 600.

Chitonomyces Bullardi Thaxter. **Figs. 32–34.** Two mature individuals, × 290. **Figs. 35.** Tip of perithecium enlarged, × 1100.

Chitonomyces Floridanus Thaxter. **Figs. 36–37.** Mature individuals, × 290. **Fig. 38.** Mature individual more highly magnified, × 600.

Monoicomyces Leptochiri Thaxter. **Fig. 39.** Individual with simple axis from abdomen of host, × 600. **Fig. 40.** Branched individual growing on mouth parts of host, × 600.

PLATE XXXV.

Monoicomyces similis Thaxter. **Fig. 1.** Mature individual, anterior view, × 600. **Fig. 2.** Posterior view showing primary appendage, × 600.

Monoicomyces Brittanicus Thaxter. **Fig. 3.** Anterior view of mature individual, × 600. **Fig. 4.** Posterior view of receptacle and primary appendages with perithecia and antheridia, × 600.

Monoicomyces Echidnoglossæ Thaxter. **Fig. 5.** Anterior view of a somewhat irregularly developed individual, × 600. **Fig. 6.** Young individual lateral view showing the primary appendage at right × 600. **Fig. 7.** Antheridium, × 1100.

Monoicomyces Homalotæ Thaxter. **Fig. 8.** Large individual from English type-material, anterior view, × 600. **Fig. 9.** Smaller form from Maine, the bases of the perithecial stalks blackened, × 600. **Fig. 10.** Young individual, lateral view showing primary appendage, at left, and antheridia, × 1100.

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PLATE XXXVI.

Monoicomyces nigrescens Thaxter. **Figs. 1–2.** Posterior view of mature individual, × 600. **Fig. 3.** Anterior view of mature individual, × 600. **Fig. 4.** Antheridium more highly magnified, × 1100.

Monoicomyces Aleocharæ Thaxter. **Fig. 5.** Well developed individual posterior view, × 600. **Figs. 6–7.** Anterior and posterior views of antheridia with four and two appendages respectively, × 1100.

Monoicomyces St. Helenæ Thaxter. **Fig. 8.** Well developed individual showing three of its four perithecigerous branches, × 600. **Fig. 9.** Individual showing one of its three perithecigerous branches with sterile appendages and antheridia subtending the terminal perithecium, × 600.

PLATE XXXVII.

Polyascomyces Trichophyæ Thaxter. **Figs. 1–2.** Two mature individuals the body of the perithecium in optical section showing the numerous ascogenic cells, × 600.

Kleidiomyces furcillatus Thaxter. **Fig. 3.** Mature individual, × 600. **Fig. 4.** Portion of a receptacle showing antheridium at the left, × 600.

Cantharomyces Platystethi Thaxter. **Figs. 5–6.** Mature individual the branches of the primary appendage destroyed, × 600.

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Eumonoicomyces Californicus Thaxter. **Figs. 9–10.** Two mature individuals, × 600.

Eumonoicomyces Papuanus Thaxter. **Figs. 11–12.** Two immature individuals, × 600. **Fig. 13.** Young individual, the primary appendage at the left with pointed terminal cell, × 1100. **Fig. 14.** Young perithecium and trichogyne, × 1100. **Figs. 15–17.** Anterior, posterior and obliquely lateral views of antheridia, × 1675. **Fig. 18.** Anterior view of antheridium in optical section, × 1675.

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PLATE XXXVIII.

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Eucantharomyces Casnoniæ Thaxter. **Figs. 4–5.** Two mature individuals, × 225. **Fig. 6.** Antheridium, × 600. **Fig. 7.** Spore, × 600.

Eucantharomyces Diaphori Thaxter. **Figs. 8–9.** Two mature individuals, × 225. **Figs. 10–11.** Two antheridia, × 600. **Fig. 12.** Spore, × 600.

Eucantharomyces Catascopi Thaxter. **Fig. 13.** Mature individual, the perithecium seen in optical section, × 225. **Fig. 14.** Mature individual, the perithecium seen in surface view, × 225. **Fig. 15.** Antheridium, × 600. **Fig. 16.** Spore, × 600.

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Eucantharomyces Xanthophœæ Thaxter. **Figs. 21–22.** Two mature individuals, × 225. **Fig. 23.** Antheridium, × 600.

Eucantharomyces Madagascarensis Thaxter. **Fig. 24.** Mature individuals, × 225. **Fig. 25.** Antheridium, × 600. **Fig. 26.** Spore, × 600.

Eucantharomyces Euprocti Thaxter. **Figs. 27–28.** Mature individuals, × 225. **Fig. 29.** Antheridium, × 600. **Fig. 30.** Spore, × 600.

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Eucantharomyces African~~a~~us Thaxter. **Figs. 35–36.** Two mature individuals, × 225. **Fig. 37.** Antheridium, × 600. **Fig. 38.** Spore, × 600.

PLATE XXXIX.

Herpomyces Phyllodromiæ Thaxter. **Fig. 1.** Partly lateral view of mature female individual seen *in situ* on spine of host, × 625. **Fig. 2.** Male and female individuals *in situ* on spine of host, × 625.

Herpomyces Platyzosteriæ Thaxter. **Fig. 3.** Female individual on spine of host showing penetration of the latter by rhizoids, × 625. **Fig. 4.** Female individual *in situ* on spine of host. A male individual is present but concealed on opposite side. A germinating spore pair near tip of spine, × 625.

Herpomyces Nyctoboræ Thaxter. **Fig. 5.** Male and female individuals *in situ* on antenna of host. The female has developed six secondary receptacles bearing perithecia, × 290. **Fig. 6.** A single secondary receptacle of a female individual with its perithecium, × 625. **Fig. 7.** Male individual producing very numerous antheridia, × 625. **Fig. 8.** Terminal portion of the primary female receptacle, × 1100.

Herpomyces Anaplectæ Thaxter. **Fig. 9.** Posterior view of female individual, × 625. **Fig. 10.** Male individual, × 625.

Herpomyces Ectobiæ Thaxter. **Fig. 11.** Female individual showing portion of integument of host bearing a spine to which the primary receptacle is attached. The latter has given rise to a branch which, creeping down the spine, has become furcate; each division giving rise to a secondary receptacle which creeps on the surface of the host and gives rise in both instances to five perithecia, × 290. **Fig. 12.** A similar individual more highly magnified, the secondary receptacle at the left is broken; that at the right developing young perithecia, × 625. **Fig. 13.** Female primary receptacle showing the origin of branch from its subbasal cell. The base of the male receptacle is shown at the left, × 500. **Fig. 14.** Young perithecium with trichogyne, × 500. **Fig. 15.** Two spores, × 1100. **Fig. 16.** Male individual in which antheridia are being produced from the primary receptacle shown *in situ* on a spine, as well as in great numbers from the secondary receptacles which have developed from it, × 625.

PLATE XL.

Herpomyces Paranensis Thaxter. **Figs. 1–2.** Two perithecia with their secondary receptacles seen from opposite sides, × 625. **Fig. 3.** Female individual showing the relation in position of the successively formed perithecia and their receptacles. A male individual is shown projecting from between the two first formed larger receptacles, × 290. **Fig. 4.** Male individual with its characteristically elongated terminal cell below which four or five antheridia are produced, × 1100. **Fig. 5.** Primary female receptacle with its characteristic elongated terminal cell, the branch from its subbasal cell shown at the right, the foot on the left, × 1100. **Fig. 6.** A spore, × 1100.

Herpomyces arietinus Thaxter. **Fig. 7.** Male and female individuals *in situ* on the integument of host; the female has produced three secondary receptacles, two of them mature, a younger one lying behind the right perithecium, × 625.

Herpomyces Zanzibarinus Thaxter. **Fig. 8.** Female individual showing primary receptacle in the middle, × 625. **Fig. 9.** Male individual, × 1100. **Fig. 10.** Primary receptacle of female individual several cells of which appear to have produced branches, × 1100.

Herpomyces tricuspidatus Thaxter. **Fig. 11.** Portion of a female secondary receptacle showing rhizoidal margin and four lobes which bear perithecia only one of which is shown, × 625. **Fig. 12.** A similar receptacle viewed from the opposite (posterior) side, × 625. **Fig. 13.** A female individual *in situ* on the integument of host producing nine perithecia on two secondary receptacles between which in the centre a male individual projects, × 290. **Fig. 14.** A male individual from which some of the antheridial branches have been removed, × 625. **Fig. 15.** One of these antheridial branches enlarged, × 1100. **Fig. 16.** Two spores, × 1100. **Fig. 17.** Primary receptacle of a female individual showing branch at right, × 625.

Herpomyces forficularis Thaxter. **Fig. 18.** Female individual with two secondary receptacles each bearing a perithecium; a male individual is shown between them, × 290. **Fig. 19.** Secondary receptacle bearing perithecia, showing connection at the right with branch from primary receptacle, × 625. **Fig. 20.** Detail of tip of perithecium, a reverse view as compared with fig. 19, × 625. **Fig. 21.** Spine with male and female primary receptacles *in situ*, the male at left has two antheridia; the female shows branch at left from its subbasal cell which becomes furcate below, × 1100. **Fig. 22.** A spore, × 1100.

PLATE XLI.

Herpomyces Diplopteræ Thaxter. **Fig. 1.** Female individual with two secondary receptacles, × 290. **Fig. 2.** A similar female individual enlarged seen from behind showing the primary receptacle which gives rise to a branch which in turn branching to the right and left forms the two secondary receptacles. A male individual is shown beside the female primary receptacle at the left, × 625. **Fig. 3.** Detail of tip of perithecium × 1100. **Fig. 4.** Male individual bearing three antheridia, × 110. **Fig. 5.** A spore, × 1100.

Herpomyces Periplanetæ Thaxter. **Fig. 6.** A group of five mature female individuals *in situ* on integument of host, the secondary receptacle having developed the characteristic shield-like covering from behind which the tips of the male individuals project in several instances, × 290. **Fig. 7.** A single typical female individual a male shown projecting from behind the tip of the shield, × 290. **Fig. 8.** A female individual *in situ* showing habit of the species when an individual grows wholly on a spine. Haustoria are shown penetrating to the medulla of the spine from the cells of the secondary receptacle and from the foot of the primary receptacle, × 500. **Fig. 9.** Female individual with shield not well developed, × 290. **Fig. 10.** Male (at left) and female individuals *in situ* on a spine; the primary receptacle of the female has developed an unusually long branch which, creeping to the base of the spine, has produced a secondary receptacle with a rudimentary shield, × 625. **Fig. 11.** Two spores, × 1100. **Fig. 12.** Part of a female primary receptacle four cells of which appear to have sent out branches to form secondary receptacles, 625. **Fig. 13.** Male individual. × 625.

Herpomyces chætophilus Thaxter. **Fig. 14.** Male and female individuals *in situ* on spine, × 625. **Fig. 15.** Female individual *in situ*, × 290. **Fig. 16.** A spore, × 1100. **Fig. 17.** Germinating spore pair *in situ* on spine, × 625. **Fig. 18.** Male (left) and young female individual showing the connection of the secondary receptacle with the branch from the primary receptacle, × 625.

PLATE XLII.

Acallomyces Homalotæ Thaxter. **Figs. 1–2.** Mature individuals, × 600. **Fig. 3.** Antheridial appendage, × 1100. **Fig. 4.** A spore, × 1100.

Acompsomyces Corticariæ Thaxter. **Fig. 5.** Mature individual; the Type, × 600.

Acompsomyces Atomariæ Thaxter. **Figs. 6–7.** Mature individuals, × 600. **Fig. 8.** Young individual showing the antheridial appendage at the left: at the right the young perithecium (procarp) bearing a furcate trychogyne the swollen tips of which bear several receptive bladder-like outgrowths, × 1100. **Fig. 9.** Detail of an antheridial appendage, × 1100.

Acompsomyces brunneolus Thaxter. **Figs. 10–11.** Two mature individuals, × 600. **Fig. 12.** Young individual with peculiar furcate trichogyne similar to that represented in fig. 8, × 1100.

Acompsomyces pauperculus Thaxter. **Figs. 13–14.** Two mature individuals, × 600. **Fig. 15.** A spore, × 625.

Dioicomyces obliqueseptatus Thaxter. **Fig. 16.** Female individual, the base broken off, × 290. **Fig. 17.** A spore, × 1100.

Dioicomyces Anthici Thaxter. **Figs. 18–20.** Female individuals, × 290. **Fig. 21.** Male individual. × 290. **Fig. 22.** Mature male (at left) and young female developed from same spore-pair. × 1100. **Fig. 23.** Mature male (at right) and young female the latter terminated by a two-celled trichogyne showing the small terminal thin-walled receptive portion. **Fig. 24.** Male spore. × 1100. **Fig. 25.** Female spore, × 1100.

Dioicomyces onchophorus Thaxter. **Figs. 26–27.** Mature female individuals. × 290. **Fig. 28.** Male individual, × 1100. **Fig. 29.** Male (at right) and female spores, × 1100.

Dioicomyces spinigerus Thaxter. **Figs. 30–31.** Mature female individuals. × 290. **Figs. 32–33.** Male individuals, × 1100. **Fig. 34.** A female spore, × 1100.

Dioicomyces Floridanus Thaxter. **Fig. 35.** Mature female individual. × 290. **Fig. 36.** Male individual, × 1100.

Chitonomyces Javanicus Thaxter. **Figs. 37–38.** Mature individuals, × 600.

Chitonomyces paradoxus Peyritsch variety. **Fig. 39.** Mature individual from Java, × 600.

Chitonomyces spinosus Thaxter. **Fig. 40.** Mature individual, × 600.

Smeringomyces anomalus Thaxter. **Fig. 41.** Female individual *in situ* on bristle of host, × 290. **Fig. 42.** Female individual *in situ* on bristle of host. The remains of a male (?) individual at right, × 1100.

PLATE XLIII.

Clematomyces Pinophili *~~Indicu~~s* Thaxter. **Fig. 1.** Well developed individual, × 290. **Fig. 2.** Antheridial branchlet, × 1100.

Ceraiomyces Dahlii Thaxter. **Figs. 3–4.** Mature individuals: fig. 3 showing a complete rhizoidal apparatus and the relation of the basal cell to the integument and body cavity of the host, × 290. **Fig. 5.** An insertion-cell bearing appendage with antheridial branches, × 1100. **Fig. 6.** A spore, × 1100.

Ceraiomyces Selenae Thaxter. **Figs. 7–8.** The two type specimens, × 290.

Compsomyces Lester~~ni~~i Thaxter. **Figs. 9–11.** Two mature individuals, × 290. **Fig. 12.** Young individual showing a single subterminal antheridium, × 1100.

PLATE XLIV.

Rhachomyces Canariensis Thaxter. **Figs. 1–2.** Two mature individuals. × 290.

Rhachomyces Philonthinus Thaxter. **Fig. 3.** Large individual on *Amichrotus* from Japan, × 290. **Fig. 4.** Smaller specimen on *Philonthus*, England, × 290.

Rhachomyces stipitatus Thaxter. **Figs. 5–6.** Two individuals from the type preparation on *Anophthalmus Rhadamanthus* Lind., the appendages much broken. Fig. 5 showing individual *in situ* on bristle of host, × 290.

Rhachomyces tenuis Thaxter. **Fig. 7.** Typical form, × 290.

Rhachomyces Dolicaontis Thaxter. **Fig. 8.** A well developed typical individual, × 290.

Rhachomyces velatus Thaxter. **Fig. 9.** Individual in which the perithecium has been partly exposed by the pressure of the cover glass, × 290.

PLATE XLV.

Rhachomyces Javanicus Thaxter. **Figs. 1–2.** Two mature individuals, × 290.

Rhachomyces velatus Thaxter. **Fig. 3.** Typical form with appendages in normal position about the perithecium, × 290.

Rhachomyces Cayennensis Thaxter. **Figs. 4–5.** Two mature individuals in which the longer appendage near the base are broken, × 290.

Rhachomyces Thalpii Thaxter. **Figs. 6–7.** Two mature individuals, × 290.

Rhachomyces Oedichiri Thaxter. **Figs. 8–9.** Two typical individuals, × 290.

Rhachomyces Zufii Thaxter. **Figs. 10–11.** Two mature individuals, × 290.

Rhachomyces Aphænopsis Thaxter. **Figs. 12–14.** Variously developed individuals: the appendages in all more or less broken. Fig. 13 a young individual showing the peculiar closely septate distal appendages, × 290.

Rhachomyces Cryptobianus Thaxter. **Fig. 15.** The type specimen, × 290.

Rhachomyces Glyptomeræ Thaxter. **Fig. 16.** The unique Type, × 290.

PLATE XLVI.

Stigmatomyces constrictus Thaxter. **Figs. 1–2.** Detail of antheridia seen from opposite sides, × 1100. **Figs. 3–4.** Mature individuals, × 290.

Stigmatomyces Elachipteræ Thaxter. **Figs. 5–6.** Two mature individuals, × 290. **Fig. 7.** Detail of antheridium, × 1100. **Figs. 8–8a.** Detail of tips of perithecia, × 1100. **Fig. 9.** Basal cell of mature individual showing concentric thickenings below nucleus, × 1100. **Fig. 10.** A spore, × 1100.

*Stigmatomyces proboscide~~æ~~*us Thaxter. **Figs. 11–12.** Two mature individuals, × 290. **Fig. 13.** Detail of antheridial appendage, × 1100. **Fig. 14.** A spore, × 1100.

Stigmatomyces gracilis Thaxter. **Figs. 15–16.** Two mature individuals, × 290. **Fig. 17.** A spore, × 1100. **Fig. 18.** Detail of antheridial appendage, × 1100.

Stigmatomyces Hydrelliæ Thaxter. **Figs. 19–21.** Mature individuals, the first two typical, × 290. **Fig. 22.** Detail of antheridial appendage, × 1100. **Figs. 23–24.** Two views of the tip of the perithecium, × 1100.

Stigmatomyces spiralis Thaxter. **Figs. 25–26.** Type forms of mature individuals, × 290. **Figs. 27–28.** Two spores, × 1100. **Fig. 29.** Detail of antheridial appendage, × 1100.

Stigmatomyces purpureus Thaxter. **Figs. 30–31.** Typical form of mature individuals, × 290. **Fig. 32.** A common variation, × 290. **Fig. 33.** A spore, × 1100. **Fig. 34–35.** Detail of tip of perithecium from different points of view, × 1100. **Fig. 36.** Detail of antheridial appendage, × 1100.

Stigmatomyces Scaptomyzæ Thaxter. **Figs. 37–39.** Mature individuals. Fig. 37 from California, the rest from Maine, × 290. **Fig. 40.** A spore, × 1100. **Fig. 41.** Detail of antheridial appendage, × 1100.

PLATE XLVII.

Stigmatomyces Limosinæ Thaxter. **Fig. 1.** A spore, × 1100. **Fig. 2.** Small stout form of mature individuals, × 290. **Figs. 3–4.** Two mature individuals of the typical form, × 290. **Fig. 5.** Detail of antheridial appendage, × 625. **Fig. 6.** Mature individual of Californian form, × 290. **Fig. 7.** Young individual: a trichoygne at the right with adherent antherozoids, × 1100.

Stigmatomyces Papuanus Thaxter. **Fig. 8.** A spore, × 1100. **Figs. 9–12.** Mature individuals illustrating variations, × 290. **Fig. 13.** Detail of antheridial appendage, × 1100.

Stigmatomyces dubius Thaxter. **Fig. 14.** A Spore, × 1100. **Figs. 15–17.** Mature individuals, × 290. **Fig. 18.** Detail of antheridial appendage, 1100.

Stigmatomyces micrandrus Thaxter. **Fig. 19.** A spore, × 1100. **Figs. 20–21.** Mature individuals, × 290. **Figs. 22–23.** Detail of antheridial appendages from opposite sides, × 1100. **Fig. 24.** Tip of perithecium, × 1100.

Stigmatomyces rugosus Thaxter. **Figs. 25–26.** Type form from Ralum, × 290. **Fig. 27.** Detail of antheridium from Ralum form, × 1100. **Fig. 28.** Mature individual from Puyallup, Washington, × 290.

Stigmatomyces humilis Thaxter. **Figs. 29–30.** Two mature individuals, × 290. **Figs. 31–32.** Detail of antheridial appendages, × 1100.

PLATE XLVIII.

Arthrorhynchus Cyclopodiæ Thaxter. **Fig. 1.** Mature individual showing lateral view of ascogenic cells: the rhizoids broken from the haustorial cell, × 290. **Fig. 2.** Mature individual showing its relation to the integument and body cavity of the host; a few of the rhizoids which form a tangled mass indicated semidiagrammatically, × 290. **Fig. 3.** Detail of antheridial appendage, × 625. **Fig. 4.** Detail of tip of perithecium seen partly in optical section showing the four papillæ which surround the ostiole, × 625. **Fig. 5.** Detail of tip of perithecium showing outer bifid protuberances, × 625. **Fig. 6.** A spore, × 625.

Arthrorhynchus Nycteribiæ (Peyritsch.). **Fig. 7.** Mature individual showing its relation to the integument of host; the perithecium shown in optical section except at its tip, × 290. **Fig. 8.** Mature individual, the perithecium shown in surface view, × 290. **Fig. 9.** Detail of antheridial appendage, × 625. **Fig. 10.** Tip of perithecium in detail, × 625.

Arthrorhynchus Eucampsipodæ Thaxter. **Fig. 11.** Mature individual from which the rhizoidal apparatus has been broken; the asci are seen end on in several rows the ascogenic cell lying behind, × 290. **Fig. 12.** Tip of perithecium in detail, × 625. **Fig. 13.** Detail of tip of perithecium seen in optical section, × 625. **Fig. 14.** Detail of antheridial appendage.

PLATE XLIX.

Teratomyces Zealandica Thaxter. **Figs. 1–2.** Anterior and posterior views of mature individuals, × 290. **Fig. 3.** Portion of an appendage with branchlet bearing two antheridia, × 1100.

Teratomyces Philonthi Thaxter. **Figs. 4–5.** Mature individuals, × 290.

Teratomyces petiolatus Thaxter. **Fig. 7.** Mature individuals, × 290.

Stigmatomyces Diopsis Thaxter. **Figs. 8–9.** Two mature individuals, × 290. **Fig. 10.** Detail of antheridial appendage, × 1100.

Stigmatomyces Limnophoræ Thaxter. **Figs. 11–12.** Two individuals not quite mature, × 290. **Fig. 13.** Detail of antheridial appendage, × 1100.

Stigmatomyces Sarcophagæ Thaxter. **Fig. 14.** Detail of antheridial appendage, × 1100. **Fig. 15.** Mature individuals; short form, × 290. **Fig. 16.** Mature individual of typical form, × 290. **Fig. 17.** Unisexual individual (male) illustrating partial atrophy in one member of a spore pair, × 290.

Stigmatomyces pauperculus Thaxter. **Fig. 18.** Mature individual, × 290. **Fig. 19.** Detail of antheridial appendage, × 1100.

Stigmatomyces Venezuelæ Thaxter. **Figs. 20–21.** Two mature individuals, × 290.

Stigmatomyces Baeri Peyritsch. **Fig. 22.** Detail of antheridium, × 1100. **Figs. 23–24.** Two mature individuals (Vienna), × 290.

PLATE L.

Sphaleromyces Latonæ Thaxter. **Figs. 1–2.** Mature individuals, × 290. **Fig. 3.** Immature individuals, × 290.

Corethromyces purpurascens Thaxter. **Figs. 4–5.** Two mature individuals, × 290.

Corethromyces Stilici Thaxter. **Figs. 6–8.** Mature individuals, × 290. **Fig. 9.** Young individual showing seriate arrangement of antheridia, × 600.

Corethromyces longicaulis Thaxter. **Figs. 10–11.** Two mature individuals, × 290.

Teratomyces insignis Thaxter. **Fig. 12.** Typical form of mature individual. × 290. **Fig. 13.** Variety with colorless receptacle, × 290.

Symplectromyces vulgaris Thaxter. **Figs. 14–15.** Mature individuals with one and four perithecia respectively, × 290. **Fig. 16.** Young individual showing antheridia and sterile appendages, × 600.

PLATE LI.

Corethromyces Brazilianus Thaxter. **Fig. 1.** Large form from Columbia, × 290. **Fig. 2.** Typical form from Brazil, × 290.

Corethromyces Cryptobii Thaxter. **Fig. 3.** Well developed individual from Kansas, × 290.

Eucorethromyces Apotomi Thaxter. **Figs. 4–5.** Mature individual from Europe. The appendages more or less broken, × 290. **Fig. 6.** Appendage of younger individual from Celebes, showing solitary and clustered antheridia, × 600.

Stichomyces Conosomæ Thaxter. **Figs. 7–9.** Mature individuals variously developed, × 290. **Fig. 10.** Young individual showing production of antheridia from primary axis, × 625.

Stichomyces Stilici Thaxter. **Figs. 11–12.** Mature individuals, × 290. **Fig. 13.** Portion of axis showing antheridia, × 1100. **Fig. 14.** Pair of spores, × 1100.

Ecteinomyces Trichopterophilus Thaxter. **Figs. 15–16.** Two normal somewhat elongated individuals, × 300. **Fig. 17.** Small stout individual in which the receptacle has failed to elongate, × 300. **Fig. 18.** Young individual showing trichogynes and antheridia, × 300.

PLATE LII.

Sphaleromyces Chiriquensis Thaxter. **Figs. 1–2.** Mature individuals, the appendages somewhat broken, × 290.

Sphaleromyces Brachyderi Thaxter. **Figs 3–5.** Two mature individuals, × 290.

Sphaleromyces atropurpureus Thaxter. **Figs. 6–7.** Mature individuals; the appendages badly broken, × 290.

Sphaleromyces Quedionuchi Thaxter. **Figs. 8–9.** Two mature individuals, × 290. **Fig. 10.** Detail of tip of perithecium, × 625.

Sphaleromyces obtusus Thaxter. **Figs. 11–13.** Mature individuals, × 290.

Sphaleromyces propinquus Thaxter. **Figs. 14–15.** Two mature individuals, × 290. **Fig. 16.** Detail of tip of perithecium, × 1100.

Sphaleromyces Indicus Thaxter. **Figs. 17–18.** Two mature individuals the appendages somewhat broken, × 290.

Rhizomyces crispatus Thaxter. **Fig. 19.** Mature individual of Type form, × 290. **Fig. 20.** A variety with differently shaped perithecium, × 290. **Fig. 21.** Detail of antheridial branchlet, × 625.

Rhizomyces gibbosus Thaxter. **Figs. 22–23.** Two mature individuals. Fig. 22 showing relation of basal cell to integument of host. The rhizoidal apparatus broken off in both specimens, × 290.

PLATE LIII.

Laboulbenia exigua Thaxter. **Fig. 1.** Mature type, × 260.

Laboulbenia proliferans var. *atrata* Thaxter. **Fig. 2.** Large form occurring on *Euchlænius trochantericus* Kolbe, × 150.

Laboulbenia proliferans var. *interposita* Thaxter. **Fig. 3.** Individual on *Chlænius* from Angola, Africa, showing partly blackened bases of appendages, × 150. **Fig. 4.** Individual on *Chlænius* from Delagoa Bay, × 150.

Laboulbenia proliferans var. *cincta* Thaxter. **Fig. 5.** Type form on *Craspidophorus adæquatus* Kolbe. Africa, × 150.

Laboulbenia proliferans var. *divaricata* Thaxter. **Fig. 6.** Type on *Chlænius* from Sandakan, N. Borneo, × 150. **Fig. 7.** Individual on *Rhembus lævis* Lesne from Java, × 150.

Laboulbenia Craspedophori Thaxter. **Fig. 8.** Individual on *Panagæus Symei* from Old Calabar Africa, × 150. **Fig. 9.** Detail of antheridial branch with insertion cell, × 625.

Laboulbenia humilis Thaxter. **Fig. 10.** Type on *Chlænius cyaniceps* Bates from Hong Kong, × 263.

Laboulbenia Brachionychi Thaxter. **Fig. 11.** Individual on *Brachionychus* sp. from Cochin China, × 150. **Fig. 12.** Detail of antheridial branchlets, × 600.

Laboulbenia subterranea Thaxter. **Fig. 13.** Form on *Stilicus geniculatus* from England, × 263. **Fig. 14.** Individual on *Trechus micros* Herbst. from Hungary, × 263. **Fig. 15.** Form on *Trechus* sp. Berlin Mus. No. 880, × 263.

Laboulbenia Atlantica Thaxter. **Fig. 16.** Typeon *Lathrobium multipunctatum*, × 263. **Fig. 17.** Form on *Gargus Schaumii*, × 263.

Laboulbenia bidentata Thaxter. **Figs. 18–19.** Mature individuals, × 263. **Fig. 20.** Detail of tip of perithecium, × 1100.

PLATE LIV.

Laboulbenia obtusa Thaxter. **Fig. 1.** Mature Type, × 280.

Laboulbenia intermedia Thaxter. **Figs. 2–3.** Two type specimens showing the appearance of the tips of the perithecium from opposite sides, the blackened external branch broken in both, × 260.

Laboulbenia Ærogenidii Thaxter. **Fig. 4.** Mature individual, the appendages considerably broken, × 260. **Fig. 5.** Young individual with tuft of antheridia, × 625.

Laboulbenia Pseudomasci Thaxter. **Fig. 6.** Mature Type, × 260.

Laboulbenia Madeiræ Thaxter. **Fig. 7.** Type form, × 260.

Laboulbenia pallida Thaxter. **Figs. 8–9.** Two individuals showing variation in appendages, × 260.

Laboulbenia Ocdodactyli Thaxter. **Fig. 10.** The Type with simple outer appendage, × 260.

Laboulbenia Ophoni Thaxter. **Fig. 11.** The Type on *Ophonus sulphuripes*, Italy × 260.

Laboulbenia Oopteri Thaxter. **Fig. 12.** The Type: external branchlet broken off, × 260.

Laboulbenia Copteæ Thaxter. × 260. **Fig. 13.** The Type.

Laboulbenia Orthomi Thaxter. **Fig. 14.** The type form of compact habit, × 260. **Fig. 15.** A more elongate variety, × 260.

Laboulbenia Stomonaxi Thaxter. **Figs. 16–17.** Two individuals, the perithecium of one containing mature spores, × 260.

Laboulbenia melanaria Thaxter. **Fig. 18.** The Type from *Ophonus germanus*, Portugal, × 260.

Laboulbenia Dryptæ Thaxter. **Fig. 19.** The Type, × 260.

Laboulbenia erecta Thaxter. **Fig. 20.** Individual from *Colpodes evanscens*, Mexico, × 260. **Fig. 21.** Type on *C. agilis* from same locality, × 260.

PLATE LV.

Laboulbenia dubia Thaxter. **Fig. 1.** The Type, × 260.

Laboulbenia Darwinii Thaxter. **Fig. 2.** Type on *Pachyteles*, Brazil, Hope Collection No. 285, × 260.

Laboulbenia olivacea Thaxter. **Fig. 3.** The Type, × 260.

Laboulbenia Anaplogenii Thaxter. **Fig. 4.** The Type on *Anaplogenius*, China, × 260. **Fig. 5.** Unusually well developed individual on *Stenolophus* from Cambridge, in which the segments of the branches are distally swollen, but which was associated with individuals normal in this respect, × 260.

Laboulbenia Platyprosopi Thaxter. **Fig. 6.** Type form, × 260.

Laboulbenia Rougetii Robin var. *Japanensis* Thaxter. **Fig. 7.** Typical form reduced as compared with other figures on the plate, × 150.

Laboulbenia Rougetii Robin. var. *Chinensis* Thaxter. **Fig. 8.** Type form, reduced, × 150.

Laboulbenia bilabiata Thaxter. **Fig. 9.** The Type, × 260.

Laboulbenia Anchonoderi Thaxter. **Fig. 10.** Type on *Anchonoderus subæneus* from Panama, × 260. **Fig. 11.** Form on *A. binotatus* from Guatemala, × 260.

Laboulbenia Pericalli Thaxter. **Fig. 12.** The Type, × 260.

Laboulbenia Euchilæ Thaxter. **Figs. 13–14.** Two type specimens, × 260.

Laboulbenia Thyreopteri Thaxter. **Fig. 15.** Variety from Borneo, × 260. (See Plate LXIV, fig. 15, for normal type.)

PLATE LVI.

Laboulbenia insularis Thaxter. **Fig. 1.** Mature Type, × 260. **Fig. 2.** Young individual showing full development of outer appendage, × 460.

Laboulbenia Latonæ Thaxter. **Figs. 3–4.** Two well-marked variations, × 260.

Laboulbenia Loxandri Thaxter. **Fig. 5.** The Type, × 260.

Laboulbenia Columbiana Thaxter. **Fig. 6.** The Type on hairs from elytra of host, × 260. **Fig. 7.** A large form from the abdomen of host, possibly a distinct species, × 260.

Laboulbenia Bledii Thaxter. **Figs. 8 & 10.** Individuals on *Bledius jacobinus* from California, × 260. **Fig. 9.** Form on *B. basalis* from Florida, × 260.

Laboulbenia pedicillata Thaxter. **Fig. 11.** Form on *Dyschirius thoracicus* from Europe, × 260.

Laboulbenia Egœ Thaxter. **Fig. 12.** The Type, × 260.

Laboulbenia notata Thaxter. **Fig. 13.** The Type, × 150.

Laboulbenia acanthophora Thaxter. **Fig. 14.** The Type, × 260.

Laboulbenia Tachyis Thaxter. **Fig. 15.** Individual on *Tachys* from Cambridge, × 260.

Laboulbenia verrucosa Thaxter. **Fig. 16.** The Type, × 260.

Laboulbenia microscopica Thaxter. **Fig. 17.** The Type, × 460.

Laboulbenia Chiriquensis Thaxter. **Fig. 18.** The Type on *Callida scintillans*, × 260.

PLATE LVII.

Laboulbenia Hawaiiensis Thaxter. **Fig. 1.** Individual on *Colpodiscus tantalus* from Oahu, × 260. **Fig. 2.** The Type on *Metromenus ero*, from Maui, × 260. **Fig. 3.** Small form on *Mecyclothorax pusillus* from Maui, × 260.

Laboulbenia sphyriopsis Thaxter. **Fig. 5.** Type form on *Metromenus epicurus*, × 260.

Laboulbenia Disenochi Thaxter. **Fig. 4.** Form on *Disenochus sulcipennis* from Kaui of a type similar to that of *L. Hawaiiensis*, × 260. **Fig. 6.** Form on *Anchonemus agonoides* from Maui, × 260. **Fig. 7.** The Type on *Disenochus sulcipennis* from Kaui, × 260.

Laboulbenia cauliculata Thaxter. **Fig. 8.** Type on *Colpodiscus posticatus*, var. *concolor* Kaui, × 260. **Fig. 9.** On *Metromenus* sp. (No. 1246) from Kaui, × 260. **Fig. 10.** Individual from *Metromenus fraudator*, Maui, × 260.

Laboulbenia cauliculata, var. *prolixa* Thaxter. **Fig. 11.** Type on *Mesothriscus tricolor*, × 260.

Laboulbenia cauliculata, var. *spectabilis* Thaxter. **Fig. 12.** The Type on *Metromenus mutabilis*, × 260.

PLATE LVIII.

Laboulbenia spiralis Thaxter. **Fig. 1.** The Type, × 260.

Laboulbenia Megalonychi Thaxter. **Fig. 2.** The Type with pendent inner appendages, × 260.

Laboulbenia obliquata Thaxter. **Fig. 3.** The Type, × 260.

Laboulbenia concinna Thaxter. **Fig 4.** Mature individual, × 260.

Laboulbenia flaccida Thaxter. **Fig. 5.** The Type, × 260.

Laboulbenia Planetis Thaxter. **Fig. 6.** The Type, × 260.

Laboulbenia Eudaliœ Thaxter. **Fig. 7.** Mature individual in which the primary branch of the outer appendage is broken off, × 260. **Fig. 8.** Young individual showing structure of outer appendage, × 260.

Laboulbenia Ceylonensis Thaxter. **Fig. 9.** The Type in which part of the outer appendage is broken off, × 260. **Fig. 10.** Part of young individual showing the outer appendage, × 260.

Laboulbenia Helluodis Thaxter. **Fig. 11.** The Type in which the outer appendage is partly broken, × 260. **Fig. 12.** Young individual showing the appendages unbroken, × 260.

Laboulbenia Tœnodemœ Thaxter. **Fig. 13.** The Type, × 260.

Laboulbenia Formicarum Thaxter. **Fig. 14.** The Type much enlarged, × 625. **Fig. 15.** Individual magnified as in the other species represented on this plate showing its relatively small size, × 260.

PLATE LIX.

Laboulbenia separata Thaxter. **Figs. 1–2.** Two mature individuals the magnification greater than that of the other figures on this plate, × 380.

Laboulbenia corethropsis Thaxter. **Figs. 3–6.** Forms from *Miscelus Javanus* from Java showing variation, × 225.

Laboulbenia protrudens Thaxter. **Figs. 7–8.** Two type forms, × 225.

Laboulbenia forficulata Thaxter. **Figs. 9–10.** Mature individual in which the appendages are variously broken, × 225. **Fig. 11.** Young individual.

Laboulbenia fissa Thaxter. **Fig. 12.** The Type on *Pericallus flavoguttatus*. Hope Coll. No. 278, × 225. **Fig. 13.** Individual on *P. guttatus*. Hope Coll. No. 301, × 225.

Laboulbenia prominens Thaxter. **Fig. 14.** The Type, × 225.

Laboulbenia distincta Thaxter. **Figs. 15–16.** The Type and a young individual, × 225.

Laboulbenia Maylayensis Thaxter. **Figs. 17–18.** Mature Types seen from opposite sides, × 225.

Laboulbenia Misceli Thaxter. **Figs. 19–20.** The Types, × 225.

Laboulbenia maculata Thaxter. **Fig. 21.** Mature Type, × 225. **Fig. 22.** Young individual, × 225.

Laboulbenia Serrimarginis Thaxter. **Fig. 23.** The Type, × 225.

Laboulbenia imitans Thaxter. **Figs. 24–25.** Types, × 225. **Fig. 26.** Young individual, × 225.

PLATE LX.

Laboulbenia tuberculifera Thaxter. **Figs. 1–3.** Three individuals from different points of view, × 225.

Laboulbenia Platystoma Thaxter. **Fig. 4.** The Type, × 225. **Fig. 5.** Detail of tip of perithecium, × 650.

Laboulbenia corrugata Thaxter. **Fig. 6.** The Type, × 225. **Figs. 7–8.** Details of the tip of the perithecium from opposite sides, × 650.

Laboulbenia leucophæa Thaxter. **Figs. 9–10.** The Types seen from opposite sides, × 225. **Fig. 11.** Detail of tip of perithecium, × 650.

Laboulbenia microsoma Thaxter. **Fig. 12.** The type, × 225.

Laboulbenia Sumatræ Thaxter. **Fig. 13.** Mature individual from *Catascopus cupripennis*, Borneo, × 225. **Fig. 14.** The Type on same host from Sumatra, × 225. **Figs. 15–16.** Detail of tips of two perithecia seen from opposite sides, × 650.

Laboulbenia Javana Thaxter. **Figs. 17–18.** Mature individuals, × 225. **Figs. 19–20.** Details of tips of two perithecia seen from opposite sides, × 650.

Laboulbenia finitima Thaxter. **Fig. 21.** The Type on *Pericallus guttatus* from Java, × 225. **Fig. 22.** Mature individual on *P. cærulescens* from Singapore, × 225. **Fig. 23.** Variety found with the last on same host, × 225.

Laboulbenia tenuis Thaxter. **Figs. 24–25.** Types on *Miscelus* from New Guinea, × 225. **Fig. 26.** Large form on *Catascopus* from Assam., India, × 225.

Laboulbenia aristata Thaxter. **Figs. 27–28.** The Types, × 225. **Fig. 29.** Tip of perithecium enlarged, × 650.

Laboulbenia subconstricta Thaxter. **Figs. 30–31.** The Types, × 225.

Laboulbenia Ceratophora Thaxter. **Figs. 32–33.** The Types on *Miscelus* from New Guinea, × 225. **Figs. 34–35.** Detail of tips of perithecia seen from opposite sides, × 650.

Laboulbenia Assamensis Thaxter. **Figs. 36–37.** The Types, × 225. **Figs. 38–39.** Detail of tips of perithecia from different points of view, × 650.

PLATE LXI.

Laboulbenia Papuana Thaxter. **Fig. 1.** The Type, × 260.

Laboulbenia insignis Thaxter. **Fig. 2.** The Type: the tips of the branchlets are mostly broken, × 260.

Laboulbenia Lebiæ Thaxter. **Fig. 3.** The Type growing at the base of the posterior legs, × 260. **Fig. 4.** Smaller form growing on legs, × 260.

Laboulbenia Clivinalis Thaxter. **Fig. 5.** The Type on *Clivina collaris* from England, × 260. **Fig. 6.** An individual from *Clivina fossor* showing secondary divisions of cell V and of the lower cells of the appendages, × 260.

Laboulbenia Oedichiri Thaxter. **Fig. 7.** The Type, × 260.

Laboulbenia dentifera Thaxter. **Fig. 8.** Unique Type, × 260.

Laboulbenia pallescens Thaxter. **Fig. 9.** Type on *Clivina fasciata* from Guatemala, × 260. **Fig. 10.** An individual from *C. dilutipennis* from Mexico, × 260.

Laboulbenia barbata Thaxter. **Fig. 11.** The Type on *Morio Georgiae* from Mexico, × 260.

Laboulbenia Madagascarensis Thaxter. **Fig. 12.** The Type, × 260.

Laboulbenia uncinata Thaxter. **Fig. 13.** Individual on *Harpalus* sp. from York, Maine, × 260.

PLATE LXII.

Laboulbenia Trichognathi Thaxter. **Fig. 1.** The Type, a mature specimen, × 150. **Fig. 2.** Younger individual, × 150.

Laboulbenia media Thaxter. **Fig. 3.** The Type, × 260. **Fig. 4.** Detail of antheridial branch, × 625.

Laboulbenia speciosa Thaxter. **Fig. 5.** The Type on *Galerita unicolor* from Brazil, × 260.

Laboulbenia pygmaea Thaxter. **Fig. 6.** The Type, × 260.

Laboulbenia adunca Thaxter. **Fig. 7.** Type, × 260. **Figs. 8–9.** Detail of the tips of the perithecium from opposite sides, × 625.

Laboulbenia minimalis Thaxter. **Figs. 10–11.** Two individuals on *Galerita* from Guyaquil, × 260.

Laboulbenia curvata Thaxter. **Fig. 12.** The Type, × 260.

Laboulbenia bicolor Thaxter. **Fig. 13.** Form on *Galerita carbonaria* from Brazil, × 260. **Fig. 14.** The Type on *Galerita* sp. from Venezuela, × 260. **Fig. 15.** Detail of antheridial branch, × 625.

Laboulbenia Colpodis Thaxter. **Fig. 16.** The Type, × 260.

Laboulbenia corniculata Thaxter. **Fig. 17.** The Type, × 260.

PLATE LXIII.

Laboulbenia Cafii Thaxter. **Fig. 1.** Mature individual from southern California, × 260. **Fig. 2.** Young individual with trichogyne, × 260.

Laboulbenia Texana, var. *pendula* Thaxter. **Fig. 3.** The Type, × 150.

Laboulbenia Texana var. *iucurvata* Thaxter. **Fig. 4.** The Type, × 150.

Laboulbenia Texana var. *rostcllata* Thaxter. **Fig. 5.** Type on *Brachinus geniculatus* from Montevideo, × 150.

Laboulbenia Texana var. *retusa* Thaxter. **Fig. 6.** The Type from Florida, × 150.

Laboulbenia Texana var. *Oaxacana* Thaxter. **Fig. 7.** Unique Type, × 150.

Laboulbenia Texana, var. ~~*suffusa*~~ Thaxter. **Fig. 8.** The Type, × 150.} var. tibialis

Laboulbenia Texana var. ~~*tibialis*~~ Thaxter. **Fig. 9.** The Type, × 150.}

Laboulbenia tortuosa Thaxter. **Fig. 10.** The Type, × 225.

Laboulbenia Ozenae Thaxter. **Fig. 11.** The Type, × 225.

Laboulbenia punctulata Thaxter. **Fig. 12.** The Type, × 225.

Laboulbenia Helluomorphae Thaxter. **Fig. 13.** Individual from *Pleuracanthus brevicollis* from Surinam, × 225. **Fig. 14.** The Type on *Helluomorpha melanaria* from the Amazon, × 225.

Loboulbenia triordinata Thaxter. **Fig. 15.** The Type on *Cordistes bicinctus* from Columbia, × 150.

Laboulbenia angularis Thaxter. **Fig. 16.** The Type, × 225. **Fig. 17.** Detail of tip of perithecium from another individual, × 625.

Laboulbenia perplexa Thaxter. **Fig. 18.** Type form, × 260.

PLATE LXIV.

Laboulbenia incerta Thaxter. **Fig. 1.** Mature individual, Brazil, × 260.

Laboulbenia geniculata Thaxter. **Fig. 2.** The type from Rosario, Argentina, × 260. **Fig. 3.** Tip of perithecium enlarged, × 625.

Laboulbenia fusiformis Thaxter. **Fig. 4.** The type from Brazil, × 150.

Laboulbenia subpunctata Thaxter. **Fig. 5.** Mature individual from the Amazon, × 260. **Fig. 6.** Type from Rosario, Argentina, × 260.

Laboulbenia punctata Thaxter. **Fig. 7.** Type from Venezuela.

Laboulbenia Pheropsophi Thaxter. **Fig. 8.** Eastern variety from Java, × 260. **Fig. 9.** Group of antheridia of the same, × 625.

Laboulbenia longicollis Thaxter. **Fig. 10.** Perfect individual from Mt. Coffee, Liberia, Africa, × 260.

Laboulbenia decipiens Thaxter. **Fig. 11.** Variety from the Amazon, × 260. **Fig. 12.** The typical small South American form from Columbia, × 260.

Laboulbenia producta Thaxter. **Fig. 13.** Fully matured individual from an undetermined host in the Museo Nacional at Buenos Aires, × 260. **Fig. 14.** A younger individual from Columbia, × 260.

Laboulbenia Thyreopteri Thaxter. **Fig. 15.** The type from Port Natal, Africa, × 225.

Laboulbenia heteroeheila Thaxter. **Fig. 16.** Detail of the tip of the perithecium of a mature individual from Timor, East Indies, ×625.

PLATE LXV.

Laboulbenia Polyhirmæ Thaxter. **Fig. 1.** Short stout form on *Polyhirma* sp. from Tangar, Africa, × 260. **Fig. 2.** Form with peculiarly differentiated tip on *P. hamifera* from Zanzibar, × 260. **Fig. 3.** The Type from Tangar, × 260.

Laboulbenia orientalis Thaxter. **Fig. 4.** Form with well developed appendages but not fully mature on *Brachinus scotomedes* from Japan, × 150. **Fig. 5.** Small curved form on *B. Chinensis*, Hong Kong, on inferior surface of prothorax, × 260.

Laboulbenia pusilla Thaxter. **Fig 6.** The Type, × 260.

Laboulbenia Japonica Thaxter. **Fig. 7.** The Type, × 260.

Laboulbenia rhinophora Thaxter. **Fig. 8.** The Type: a mature individual in which the appendages are almost wholly broken off, × 260. **Fig. 9.** A young individual in which the appendages are almost intact, × 260.

Laboulbenia æquatorialis Thaxter. **Fig. 10.** The Type, × 150. **Fig. 11.** Portion of appendage enlarged showing character and origin of the antheridial branchlets and the antheridia, × 500.

Laboulbenia falcata Thaxter. **Fig. 12.** The Type, × 260.

Laboulbenia celestialis Thaxter. **Fig. 13.** The Type on *Drypta lincola* from China, × 260. **Fig. 14.** Variety on *Dichranonchus* sp. from Japan, × 260.

Laboulbenia Asiatica Thaxter. **Fig. 15.** Typical form, × 260.

PLATE LXVI.

Laboulbenia gibbifera Thaxter. **Fig. 1.** The Type, × 260.

Laboulbenia Dercyli Thaxter. **Fig. 2.** The Type, × 260. **Fig. 3.** Insertion-cells of young individual showing detail of appendages, × 461.

Laboulbenia melanopus Thaxter. **Fig. 4.** Mature individual with the appendages much broken, × 260. **Fig. 5.** Distal portion of a young individual showing the appendages in better condition, × 461.

Laboulbenia Acrogenys Thaxter. **Figs. 6–7.** The Types, × 260. **Fig. 8.** Portion of an antheridial branch enlarged, × 625.

Laboulbenia Italica Thaxter. **Fig. 9.** The Type, × 260. **Fig. 10.** An antheridial branchlet enlarged, × 625.

Laboulbenia Cubensis Thaxter. **Fig. 11.** The Type, × 260. **Fig. 12.** Tip of the perithecium in a larger specimen seen from the opposite side, × 260. **Fig. 13.** An appendage showing the insertions of numerous branchlets, × 461.

Laboulbenia anomala Thaxter. **Fig. 14.** The Type: its appendages somewhat broken, × 260. **Fig. 15.** Young individual from the Zambesi, × 260.

Laboulbenia constricta Thaxter. **Fig. 16.** Mature individual, × 260.

Laboulbenia coarctata Thaxter. **Fig. 17.** Mature individual, × 260.

Laboulbenia aquatica Thaxter. **Fig. 18.** The Type, × 260. **Fig. 19.** An appendage with antheridia, × 615.

Laboulbenia strangulata Thaxter. **Fig. 20.** The Type from Timor, × 260.

PLATE LXVII.

Laboulbenia bicornis Thaxter. **Fig. 1.** The Type, × 260. **Fig. 2.** Posterior view of tip of perithecium, × 460.

Laboulbenia dactylophora Thaxter. **Fig. 3.** Small form on *Orectogyros ornaticollis* from Madagascar, × 260. **Fig. 4.** The Type on *O. specularis* from the Gold Coast, Africa, × 260.

Laboulbenia drepanalis Thaxter. **Fig. 5.** The Type from the Amazon, its appendages almost wholly broken off. **Fig. 6.** A smaller form from Bugaba, Mexico, × 260.

Laboulbenia denticulata Thaxter. **Fig. 7.** The Type, × 260. **Fig. 8.** Branch of an appendage, × 625. **Fig. 9.** Tip of the perithecium from opposite side to that seen in fig. 7, × 625.

Laboulbenia Orechtochili Thaxter. **Fig. 10.** Individual on *Orechtochilus oblongiusculus* from Pedong having but two appendages, × 260. **Fig. 11.** The Type on *O. cordatus*, × 260.

Laboulbenia denticulata Thaxter Var. **Fig. 12.** Mature individual on *Macrogyrus elongatus* from New Guinea, × 260. **Fig. 13.** Detail of tip of perithecium, × 461.

Laboulbenia fallax Thaxter. **Fig. 14.** The Type. The tips of some of the appendages are supplied, × 260. **Fig. 15.** An appendages with the insertions of two broken branchlets, × 625.

Laboulbenia rotundata Thaxter. **Fig. 16.** The Type, × 260.

Laboulbenia Dincutis Thaxter. **Fig. 17.** The Type. A small individual on *Dineutes* sp. from Pondicherry, × 260. **Fig. 18.** Detail of the tip of the perithecium, × 625.

Laboulbenia chætophora Thaxter. **Fig. 19.** The Type, × 260.

PLATE LXVIII.

Hydrophilomyces rhyncophorus Thaxter. **Figs. 1–2.** Two mature individuals seen from different points of view and varying in the development of their receptacles. The terminal portions of the appendages are in part broken, × 270. **Fig. 3.** Basal portion of an appendage in a young individual showing structures supposed to be antheridia. **Fig. 4.** A supposed antheridium enlarged.

Rhyncophoromyces elephantinus Thaxter. **Fig. 5.** The type, × 230.

Ceratomyces Californicus Thaxter. **Fig. 6.** A perfect mature individual from Maine, × 290. **Fig. 7.** The type from California, × 290.

Autoicomyces acuminatus Thaxter. **Fig. 8.** The type, × 290.

PLATE LXIX.

Ceratomyces curvatus Thaxter. **Fig. 1.** The type, × 270.

Ceratomyces cladophorus Thaxter. **Fig. 2.** Mature type, × 270.

Hydrophilomyces reflexus Thaxter. **Fig. 3.** The type showing bulbous insertion.

Ceratomyces ansatus Thaxter. **Fig. 4.** The type from Brazil, × 270. **Fig. 5.** Individual from Florida with distal branchlets developed from the appendages, × 270.

Ceratomyces procerus Thaxter. **Fig. 6.** The Type, from Brazil.

Autoicomyces ornithocephalus Thaxter. **Figs. 7–8.** Mature individuals seen from opposite sides, × 290. **Fig. 9.** Spore, × 500.

PLATE LXX.

Rhynchophoromyces denticulatus Thaxter. **Fig. 1.** Mature individual, × 270.

Ceratomyces Braziliensis Thaxter. **Fig. 2.** The Type, × 270.

Ceratomyces Mexicanus Thaxter. **Fig. 3.** The Type, × 270.

Ceratomyces Floridanus Thaxter. **Fig. 4.** The Type, × 270.

Ceratomyces spinigerus Thaxter. **Fig. 5.** The Type, × 270. **Fig. 6.** Posterior view of the tip of the perithecium, × 600.

Misgomyces Stomonaxi Thaxter. **Figs. 7–8.** The Types, × 290. **Fig. 8.** Young individual.

Misgomyces Dyschirii Thaxter. **Figs. 9–10.** Mature individuals, × 290.

PLATE LXXI.

Distichomyces Leptochiri Thaxter. **Figs. 1–3.** Mature individuals of various form, × 290. **Fig. 4.** Young individual with primary terminal appendage and single antheridial branch at left, × 625. **Fig. 5.** An antheridial branch with terminal group of six antheridia, × 1800. **Fig. 6.** Younger individual showing the first division in the subbasal cell, × 1090.

Coreomyces curvatus Thaxter. **Fig. 7.** Mature individual, × 290. **Fig. 8.** Young individual. Portion above appendiculate cells before the endogenous formation of the procarp has begun, × 625. **Fig. 9.** A later stage in which the branches destined to form the procarp and the endogenous perithecium have begun to arise distally from the third cell and are growing into the cavity of the fourth, × 625. **Fig. 10.** A later stage of the same in which the procarpic branch having outstripped the others has grown through the cells above and is about to perforate the tip, × 625. **Fig. 11.** A later stage showing the antheridial appendages below and the procarpic branch above, which has perforated the terminal cell and has formed a short branched trichogyne, × 625. **Fig. 12.** A similar stage enlarged showing the origin of the procarp and of a sterile branch, wall-cell branch, from a common basal cell, × 1060. **Fig. 13.** One of the antheridial branches showing the formation of antherozoids from undifferentiated cells of the branch, × 1060. **Fig. 14.** Rhizoid-like foot spreading on surface of wing, × 1060. **Fig. 15.** Spore, × 615.

Coreomyces Corisæ Thaxter. **Fig. 16.** Mature individual, × 290. **Fig. 17.** Young individual before development of perithecial or procarpic branch, × 500. **Fig. 18.** Spore, × 625.

Autoicomyces falciferus Thaxter. **Fig. 19.** Mature individual, × 290.

Kainomyces Isomali Thaxter. **Figs. 20–21.** Mature individuals, × 290. **Fig. 22.** Young individual with two perithecigerous branches beginning to develop at the right, × 500.

Euzodiomyces Lathrobii Thaxter. **Fig. 23.** The Type, × 290.

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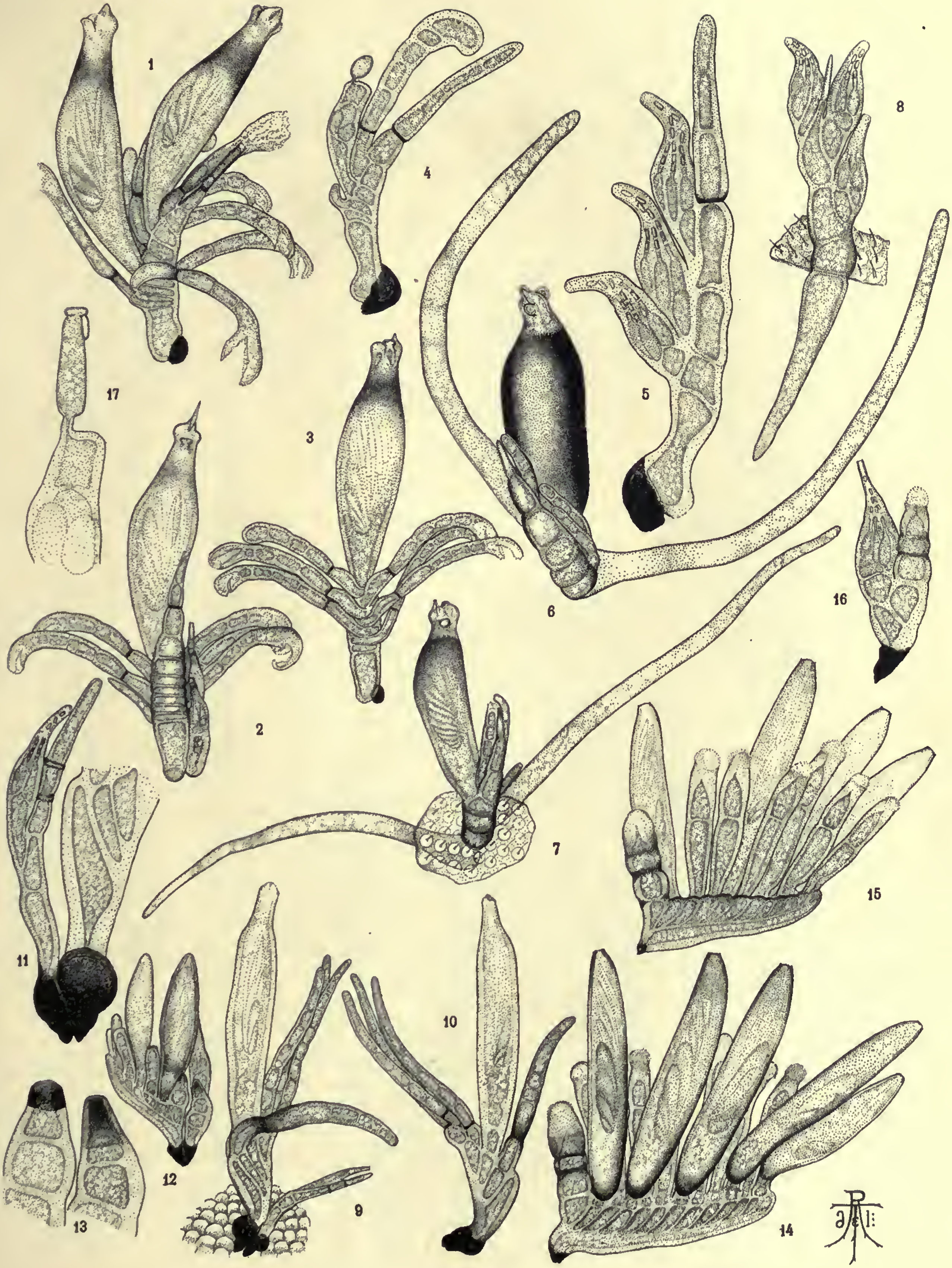
Dimeromyces coarctatus 1-5 & 17 – p. 244
" rhizophorus 6-8 – p. 243
" Forficulae 9-11 – p. 242

Dimorphomyces Thleoporae 12-13 – p. 241
" Myrmedoniae 14-16 – p. 240

PLATE XXVIII.



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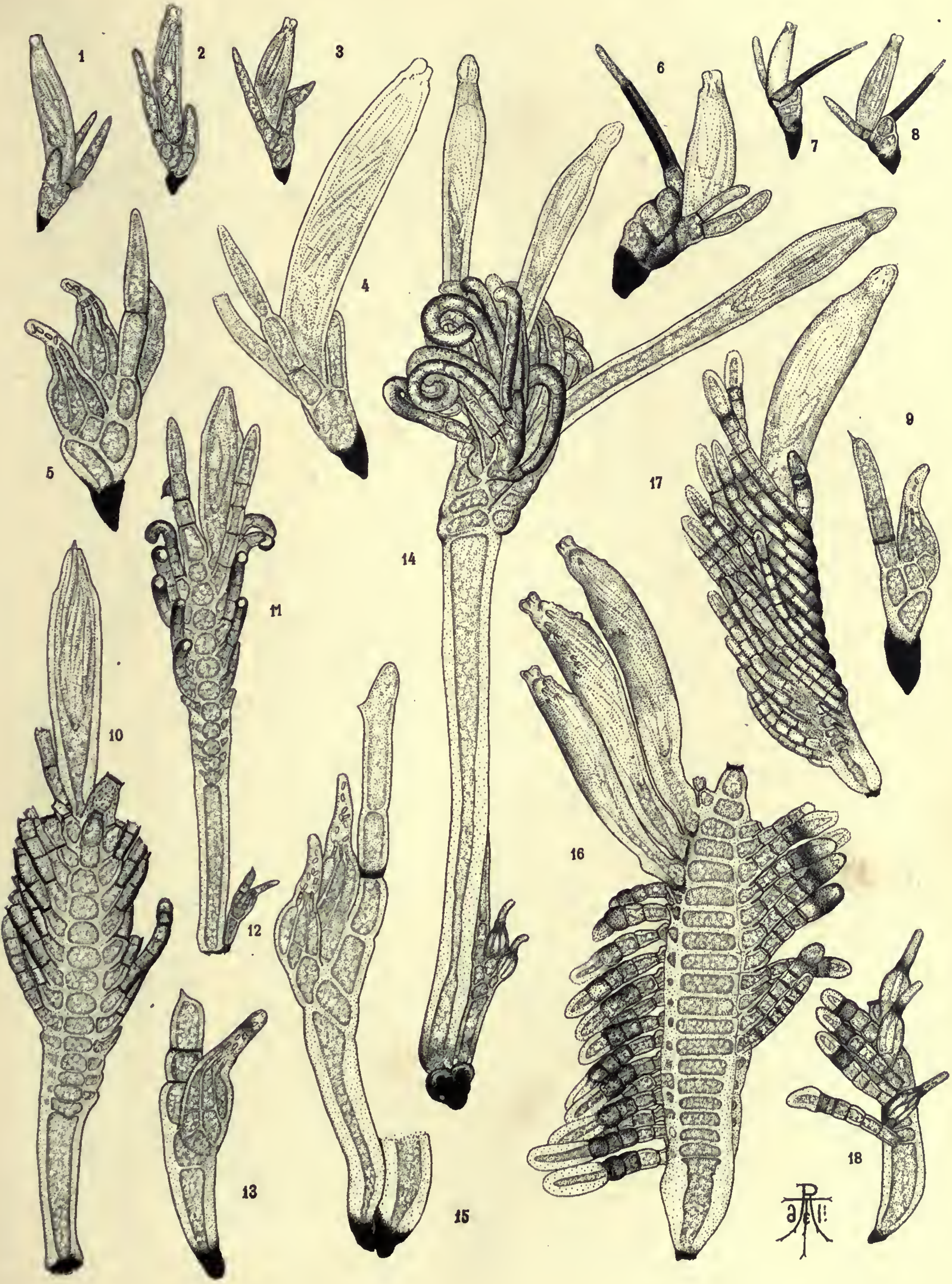
THAXTER.—LABOULBENIACEAE

Dimeromyces Labiae	1-5	– p. 242
" minutissimus	6-9	– p. 242
" nanomasculus	10-13	– p. 245
" crispatus	14-15	– p. 245
" pinnatus	16-18	– p. 246



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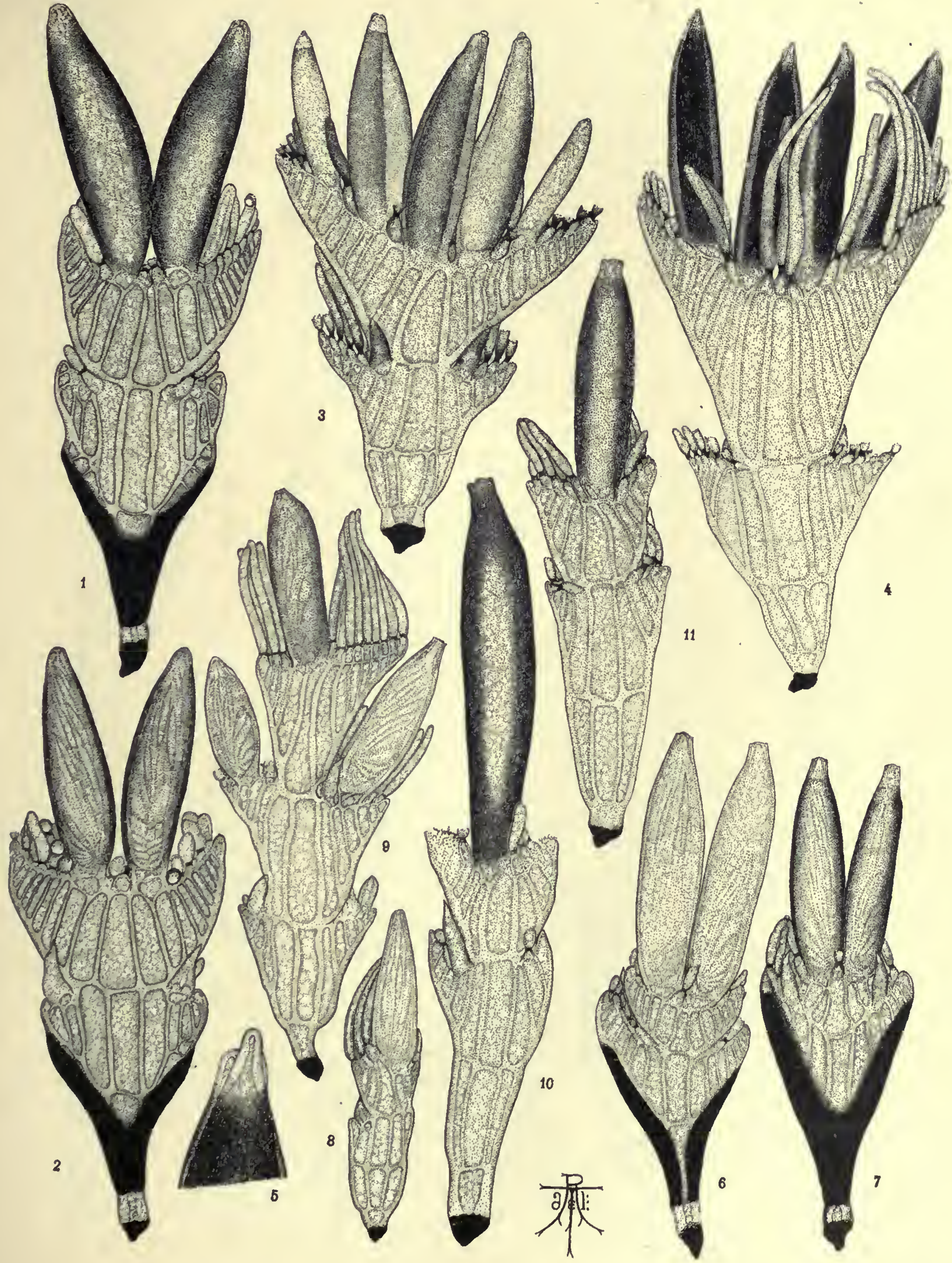
THAXTER,—LABOULBENIACEAE

Dichomyces Cafianus	1-2	p.258
D. Peruvianus	3-5	p.257
D. angolensis	6-7	p.257
Peyritschiella protea	8-9	p.260
P. amazonica	10	p.261
P. Xanthopygi	11	p.261



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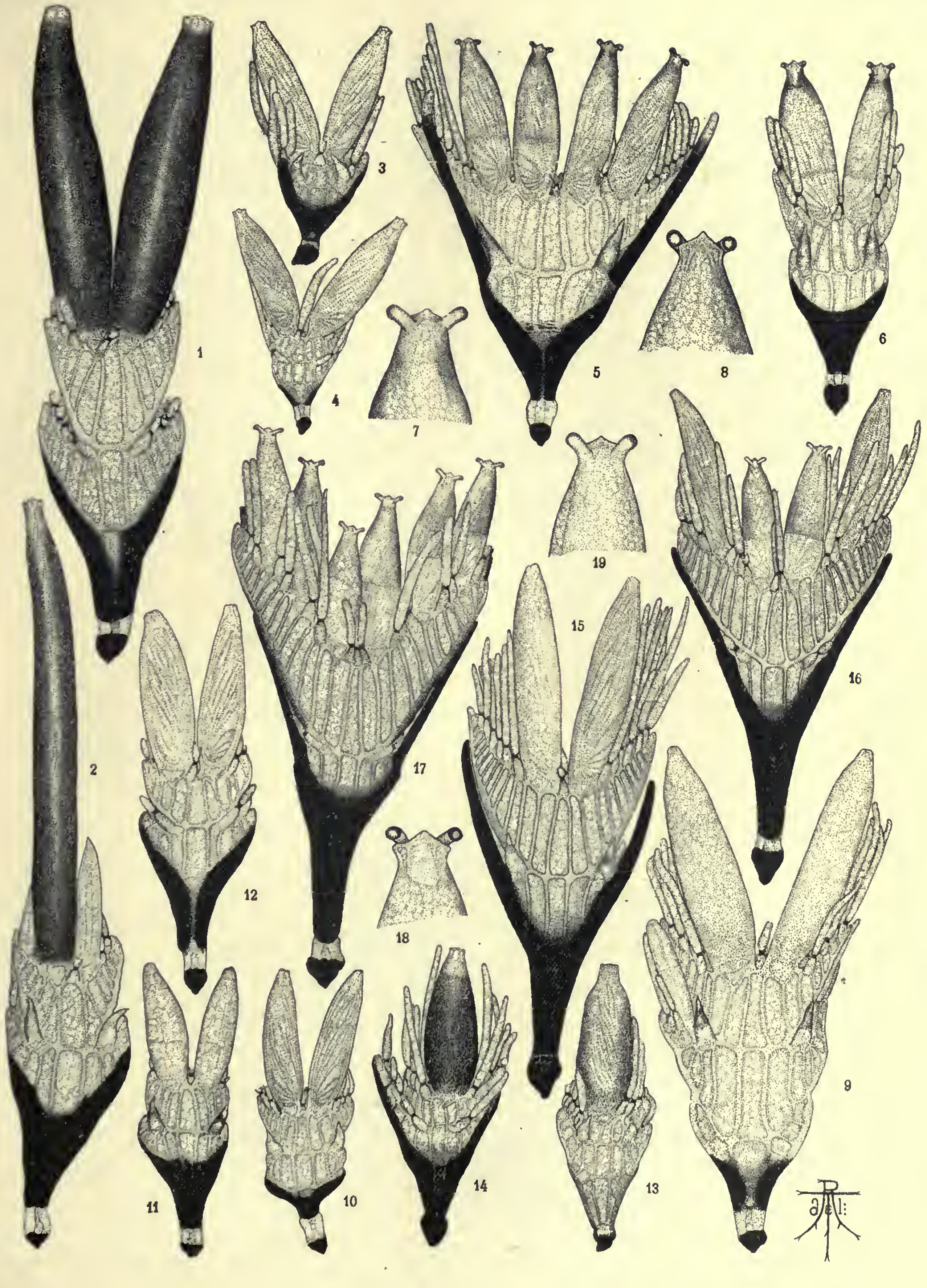
THAXTER.—LABOULBENIACEAE

Dichomyces exilis	1–2	p. 257
D. infectus	3–4	p. 258
D. vulgatus	5–9	p. 251
D. furciferus	10–12	p. 250
D. homalotae	13–14	p. 259
D. hybridus	15–19.	p. 253



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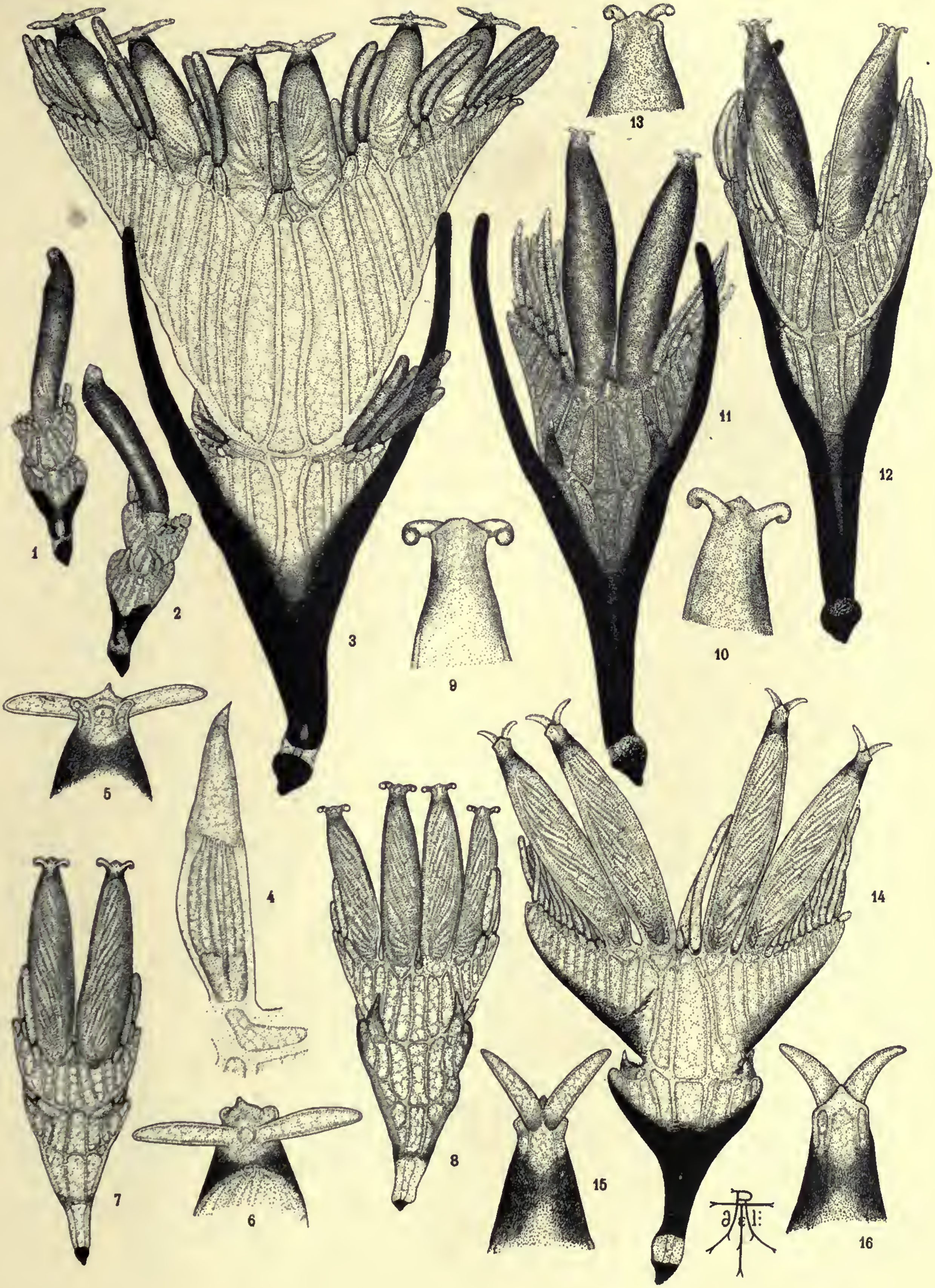
Dichomyces

D. Javanus	1-2	p. 259
D. insignis	3-6	p. 255
D. dubius	7-10	p. 252
D. Madagascarensis	11-13	p. 254
D. bifidus	14-16	p. 255



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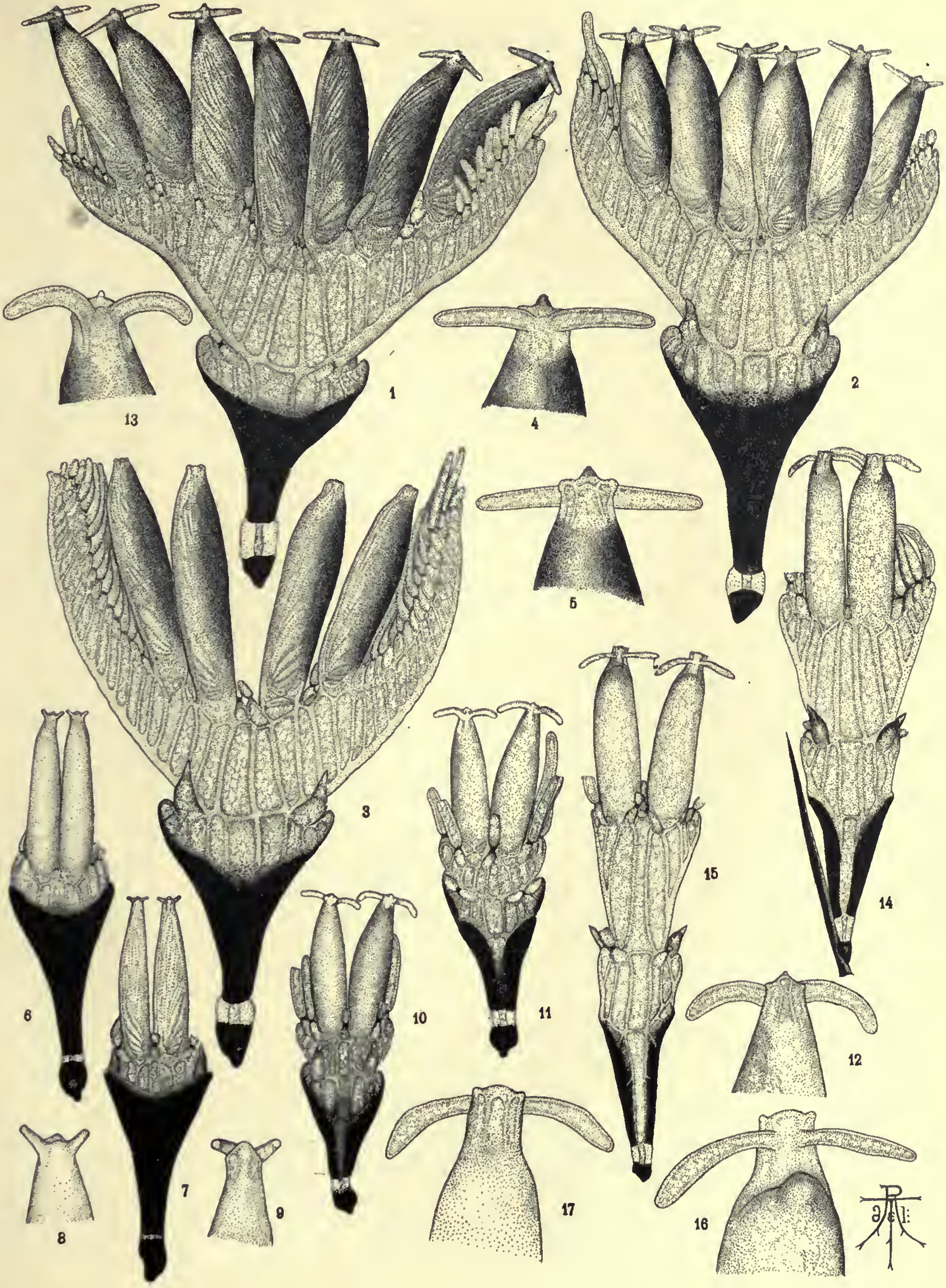
THAXTER,—LABOULBENIACEAE

Dichomyces biformis	1–5	p. 254
D. Belonychi	6–9	p. 251
D. Australiensis	10–13	p. 256
D. Mexicanus	14–17.	p. 256



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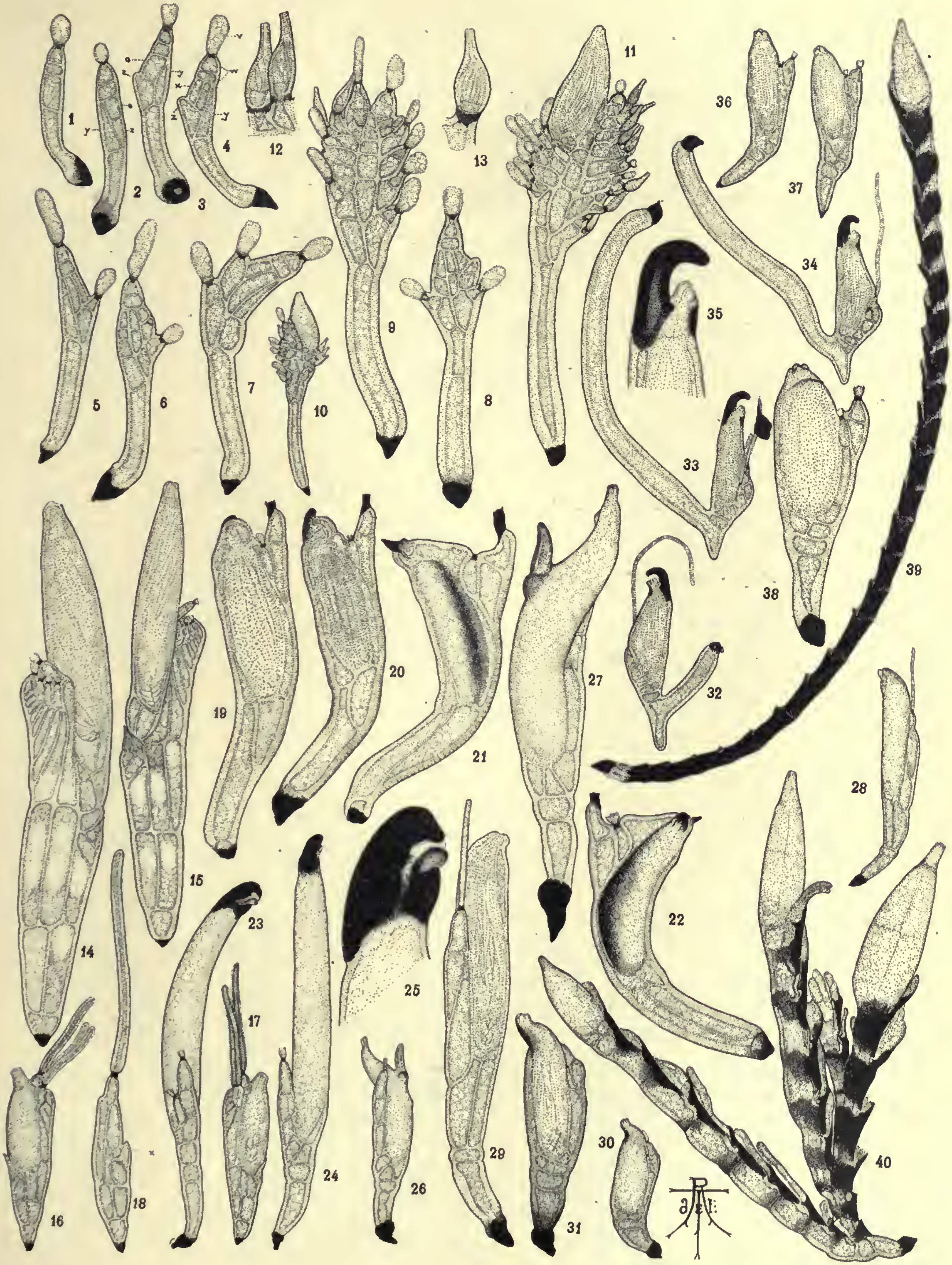
THAXTER.— LABOULBENIACEAE

Rickia	Wasmanni	1-13	p. 248.
Limnaiomyces	Tropisterni	14-15	p. 262
"	Hydrocharis	16-18	p. 262
Chitonomyces	Orectogyri	19-20	p. 266
"	Aethiopicus	21-22	p. 267
"	psittacopsis	23-25	p. 266
"	dentiferus	26-27	p. 264
"	Hydropori	28-29	p. 263
"	occultus	30-31	p. 264
"	Bullardi	32-35	p. 265
"	Floridanus	36-38	p. 264
Monoichomyces	Leptochiri	39-40.	p. 272



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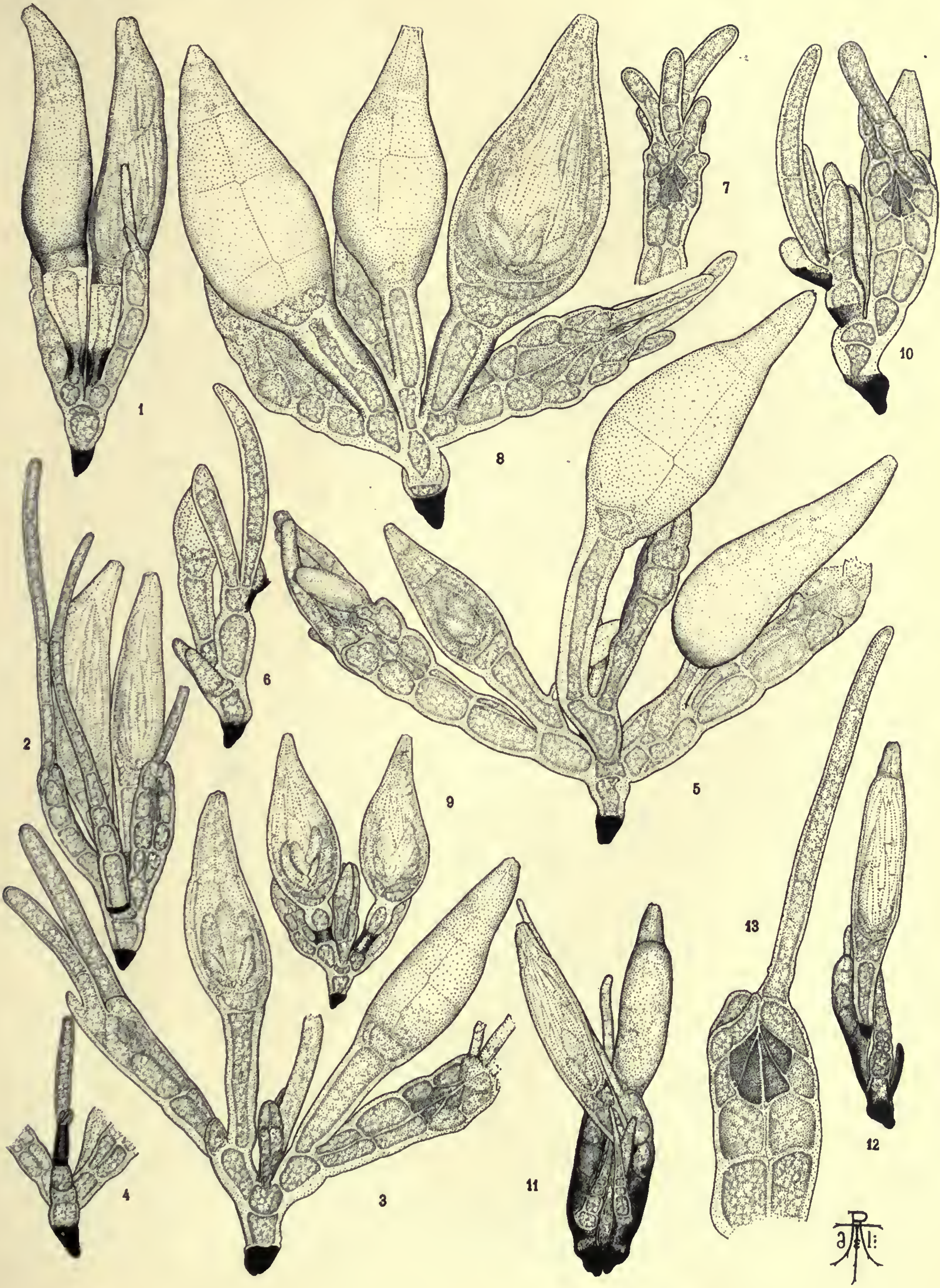
THAXTER,—LABOULBENIACEAE

Monoicomyces similis	1-2	p.269.
Monoicomyces Brittanicus	3-4	p.269
Monoicomyces Echidnoglossae	5-7	p. 269
Monoicomyces Homalotae	8-10	p. 268
Monoicomyces Oxypodae	11-13	p. 271



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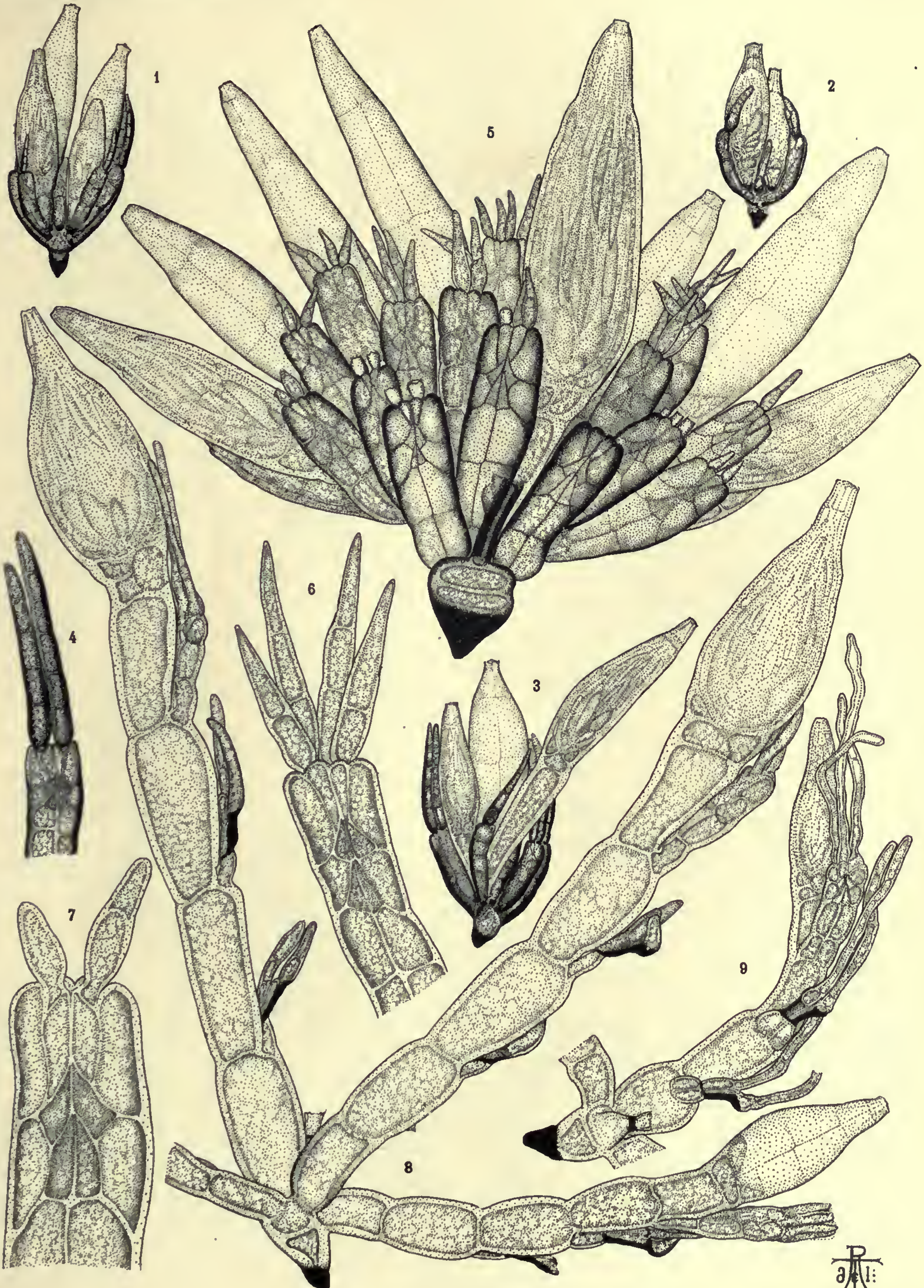
THAXTER.—LABOULBENIACEAE

Monoicomyces nigrescens	1–4	p. 270
Monoicomyces Aleocharae	5–7	p. 270
Monoicomyces St Helenae	8–9	p. 272

PLATE XXXVI.



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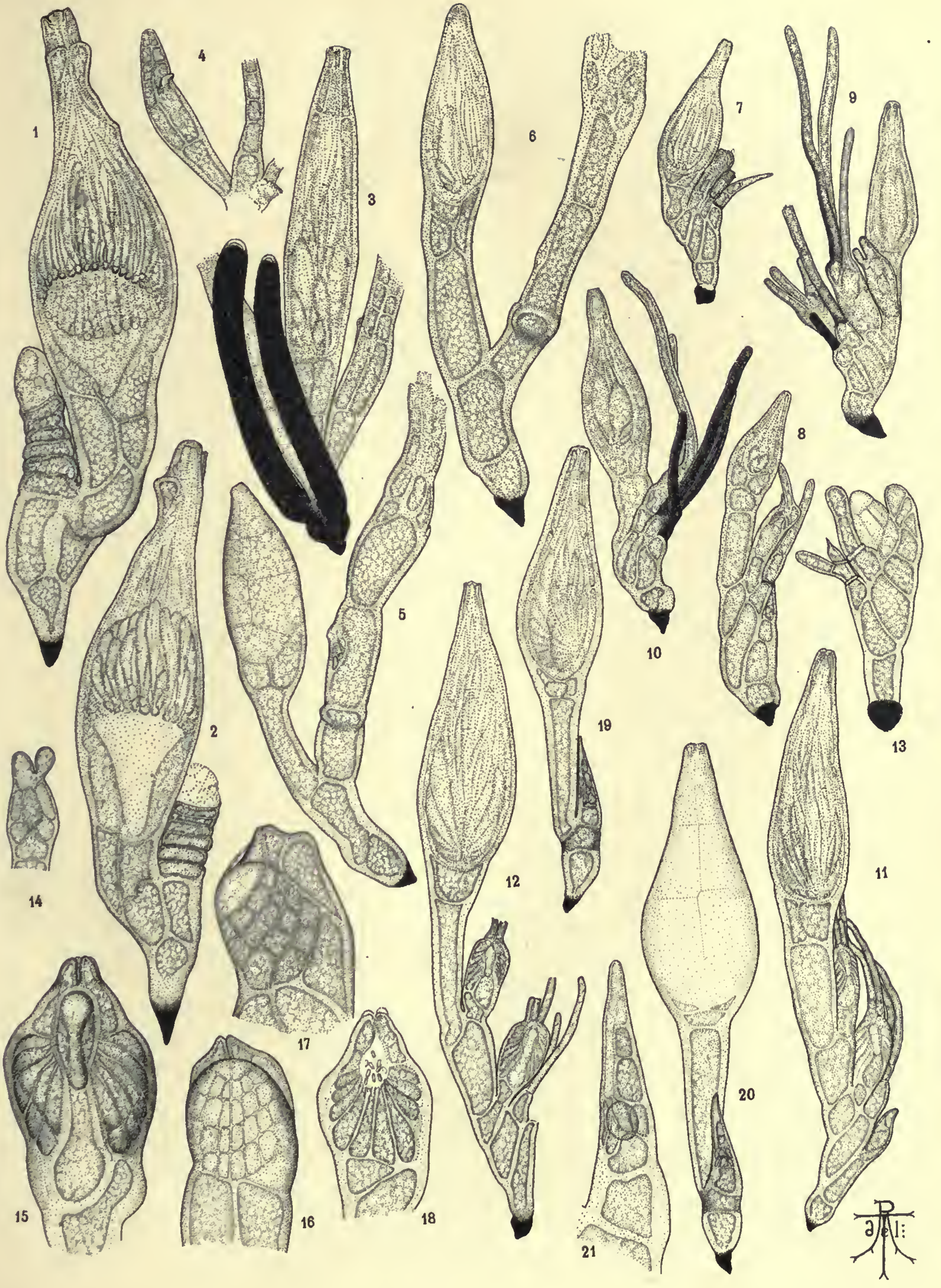
THAXTER.—LABOULBENIACEAE

Polyascomyces Trichophyae	1–2	p. 300
Kleidiomyces furcillatus	3–4	p. 281
Cantharomyces Platystethi	5–6	p. 282
Eumonoicomyces invisibilis	7–8	p. 275
Eumonoicomyces Californicus	9–10	p. 274
Eumonoicomyces Papuanus	11–18	p. 274
Euhaplomyces Ancyrophori	19–21	p. 281

PLATE XXXVII.



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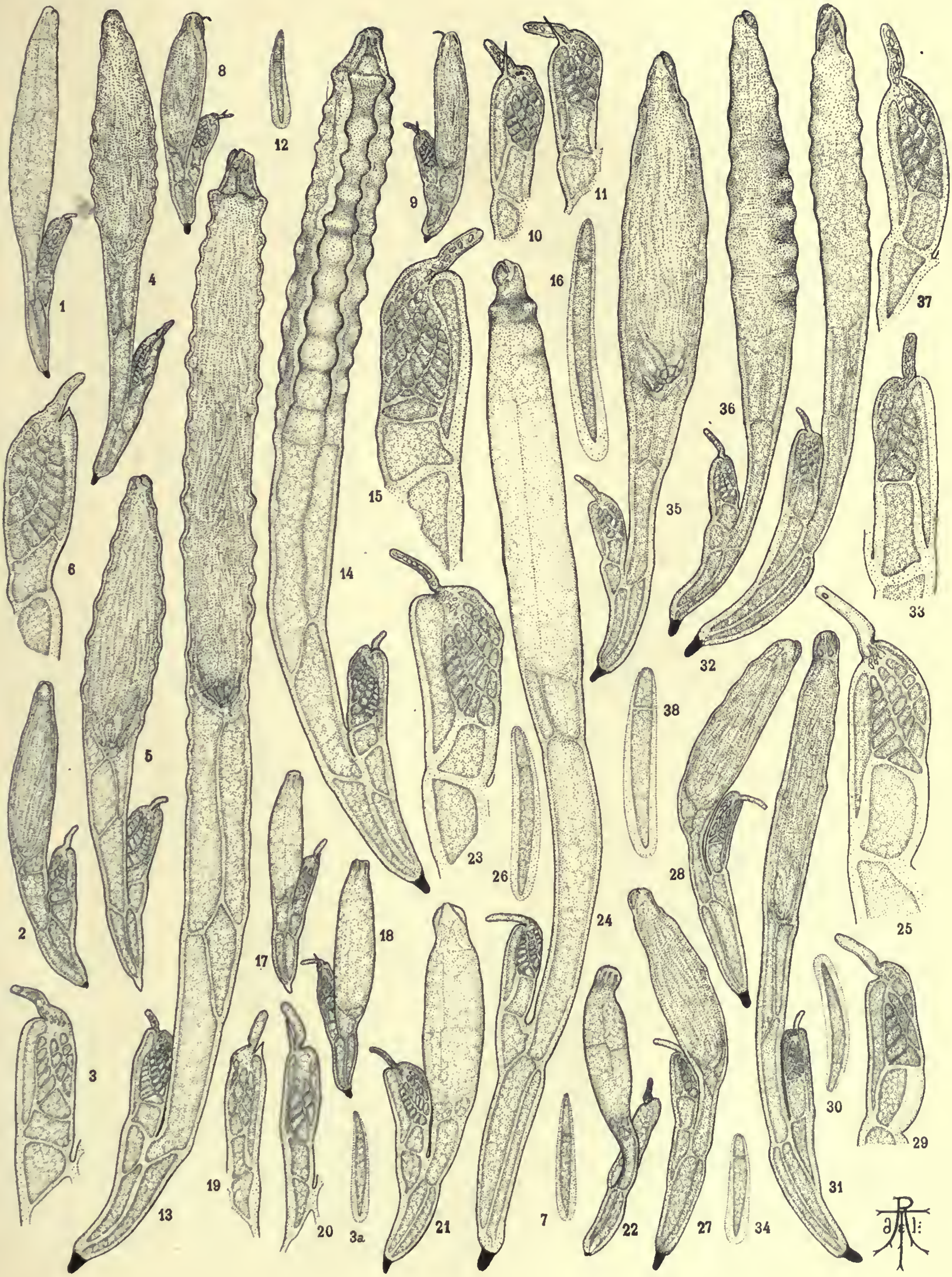
THAXTER.—LABOULBENIACEAE

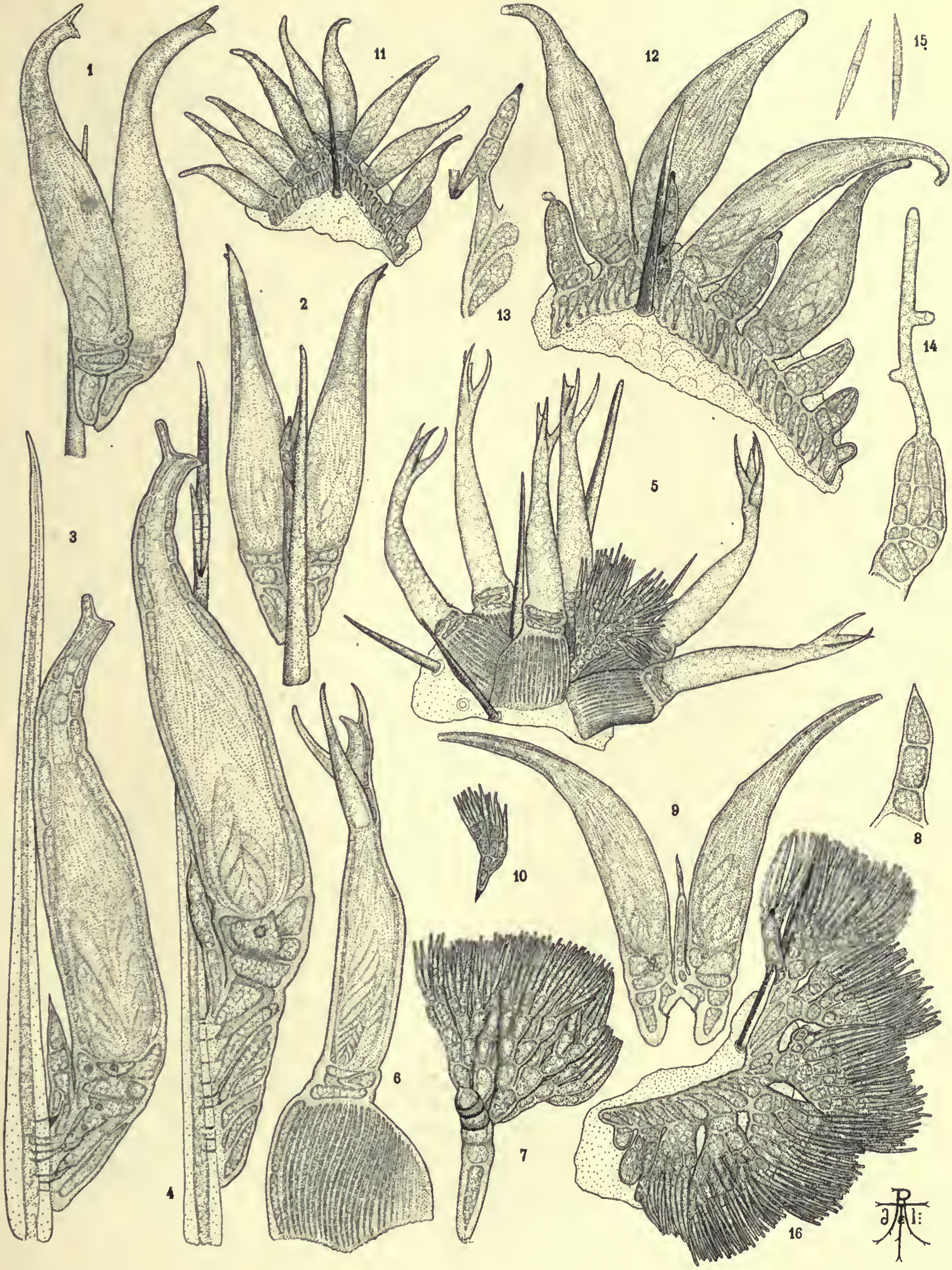
Eucantharomyces Atrani	1 – 3	p. 277
Eucantharomyces Casnoniae	4 – 7	p. 278
Eucantharomyces Diaphori	8 – 12	p. 279
Eucantharomyces Catascopi	13 – 16	p. 279
Eucantharomyces spinosus	17 – 20	p. 276
Eucantharomyces Xanthophaeae	21 – 23	p. 280
Eucantharomyces Madagascarensis	24 – 26	p. 278
Eucantharomyces Euprocti	27 – 30	p. 277
Eucantharomyces Callidae	31 – 34	p. 277
Eucantharomyces Africanus	35 – 38	p. 278



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Herpomyces Phyllodromiae	1-2	p. 288
Herpomyces Platyzosteriae	3-4	p. 286
Herpomyces Nyctoborae	5-8	p. 292
Herpomyces Amplectae	9-10	p. 289
Herpomyces Ectobiae	11-16	p. 289

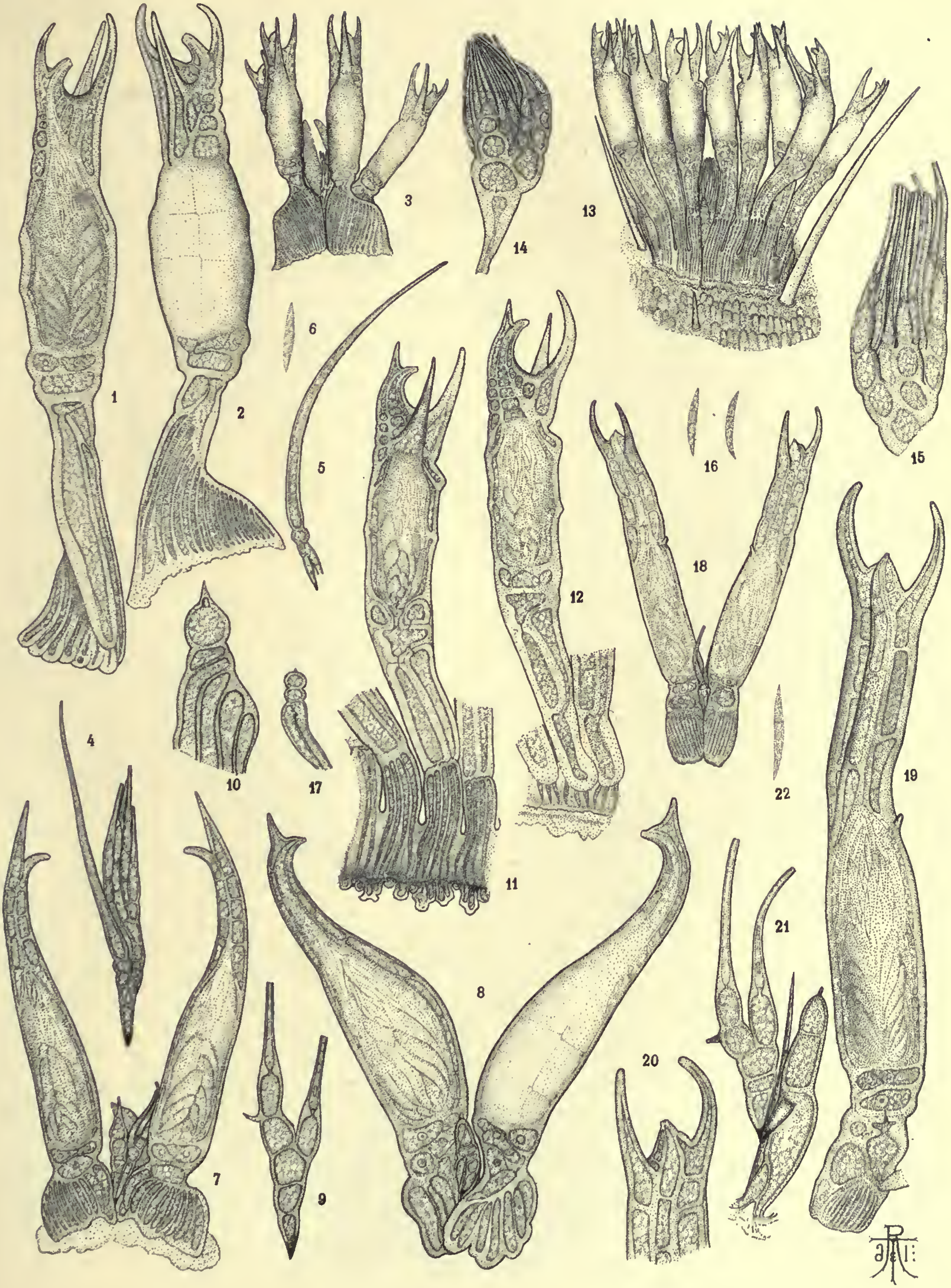


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

11-16.-A.

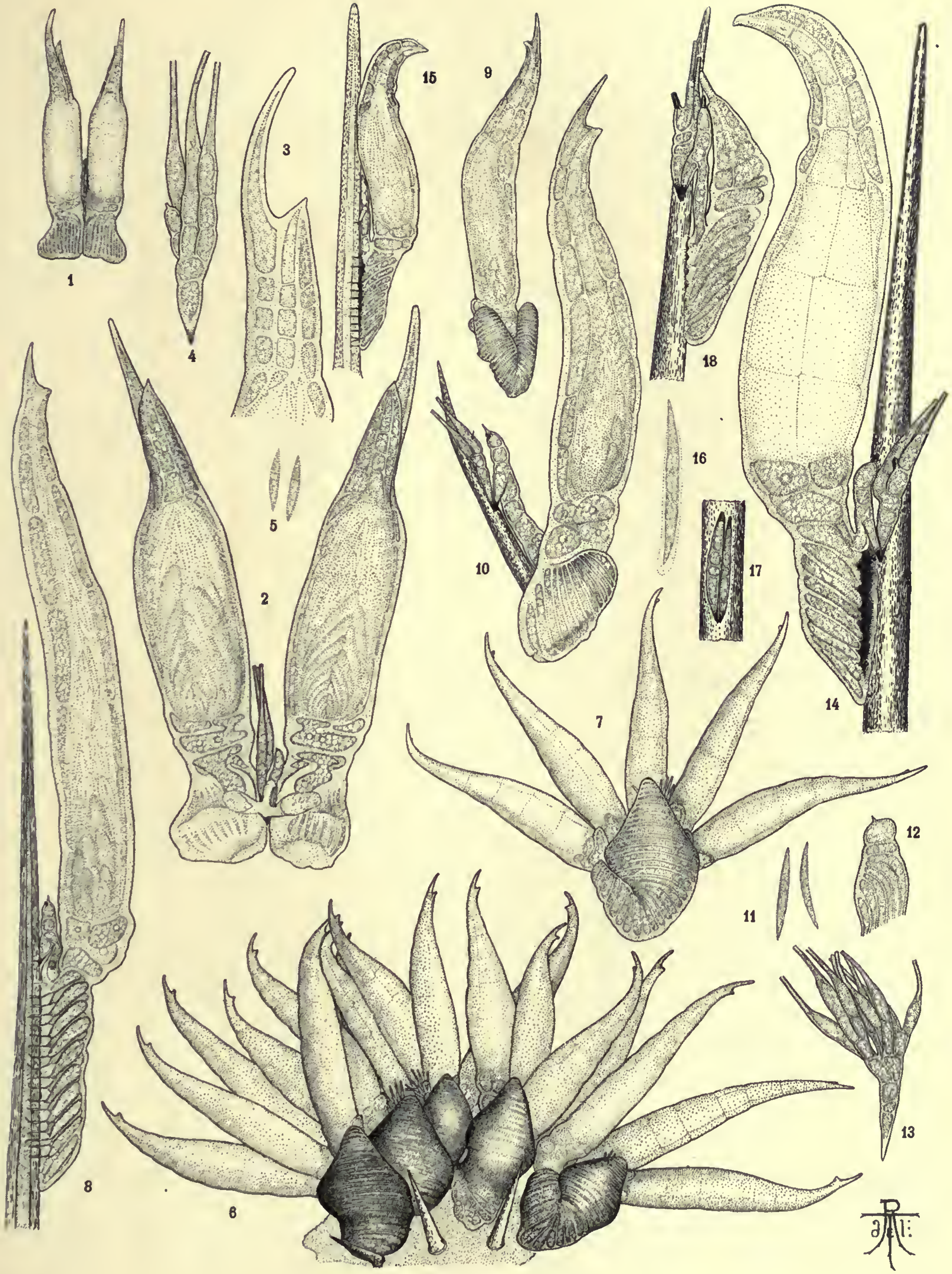
Herpomyces Paranensis	1–6	p. 292
Herpomyces arietinus	7	p. 287
Herpomyces Zanzibarinus	8–10	p. 287
Herpomyces Tricuspidatus	11–17	p. 290
Herpomyces forficularis	18–22	p. 290



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Herpomyces Diplopterae	1-5	p. 288
Herpomyces Periplanetae	6-13	p. 285
Herpomyces chaetophilus	14-18	p. 285

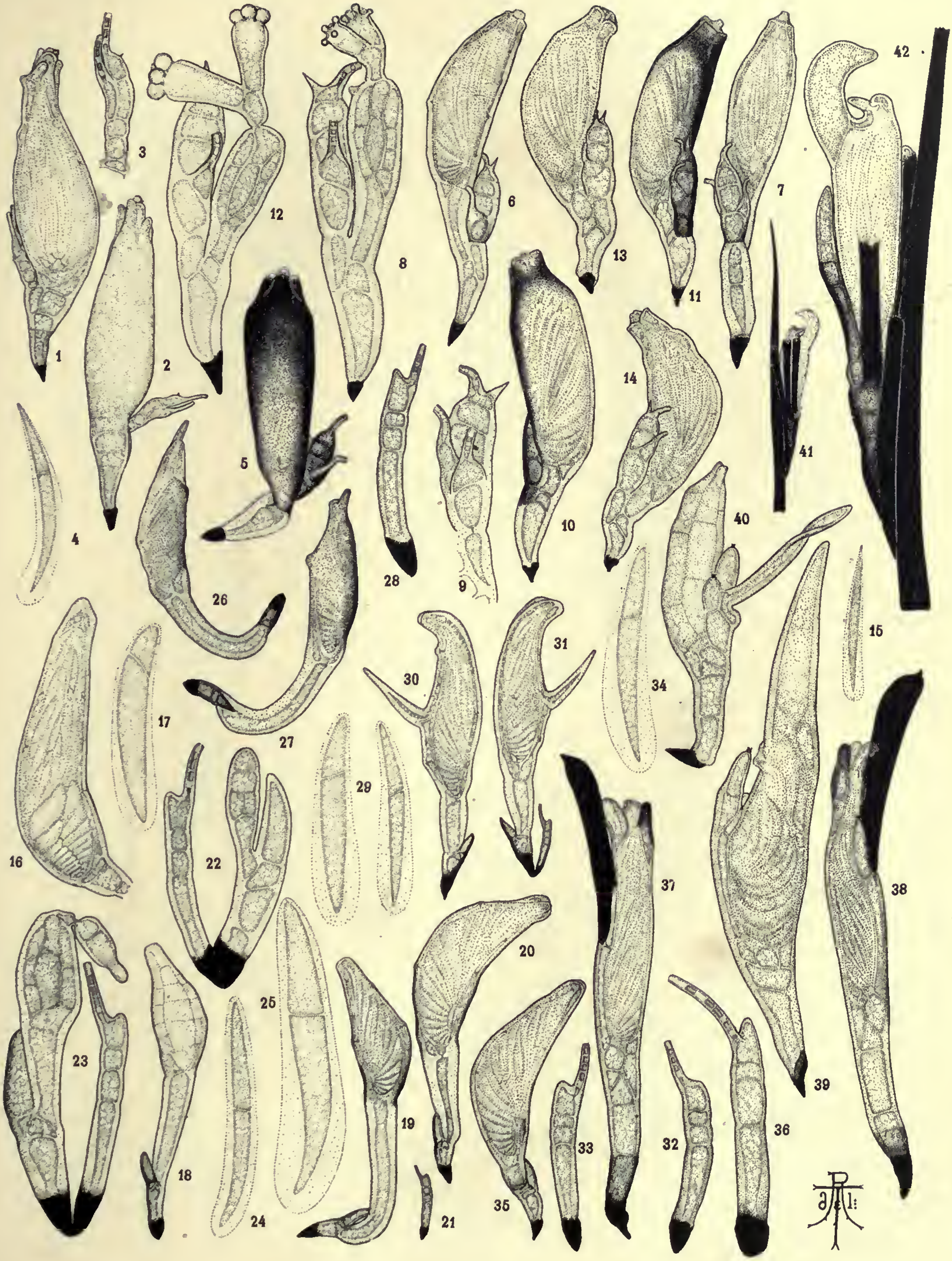


COCKAYNE, BOSTON.

THAXTER,—LABOULBENIACEAE

6-13.- H. Periplane

Acallomyces Homalotae	1-4	p. 300
Acompsomyces Corticariae	5	p. 298
Acompsomyces Atomariae	6-9	p. 299
Acxompsomyces brunneolus	10-12	p. 298
Acompsomyces pauperculus	13-15	p. 298
Dioicomyces obliqueseptatus	16-17	p. 296
Dioicomyces Anthici	18-25	p. 294
Dioicomyces onchophorus	26-29	p. 294
Dioicomyces spinigerus	30-34	p. 295
Dioicomyces Floridanus	35-36	p. 295
Chitonomyces Javanicus	37-38	p. 266
Chitonomyces paradoxus	39	p. 264
Chitonomyces spinosus	40	p. 265
Smeringomyces anomalus	41-42	p. 296

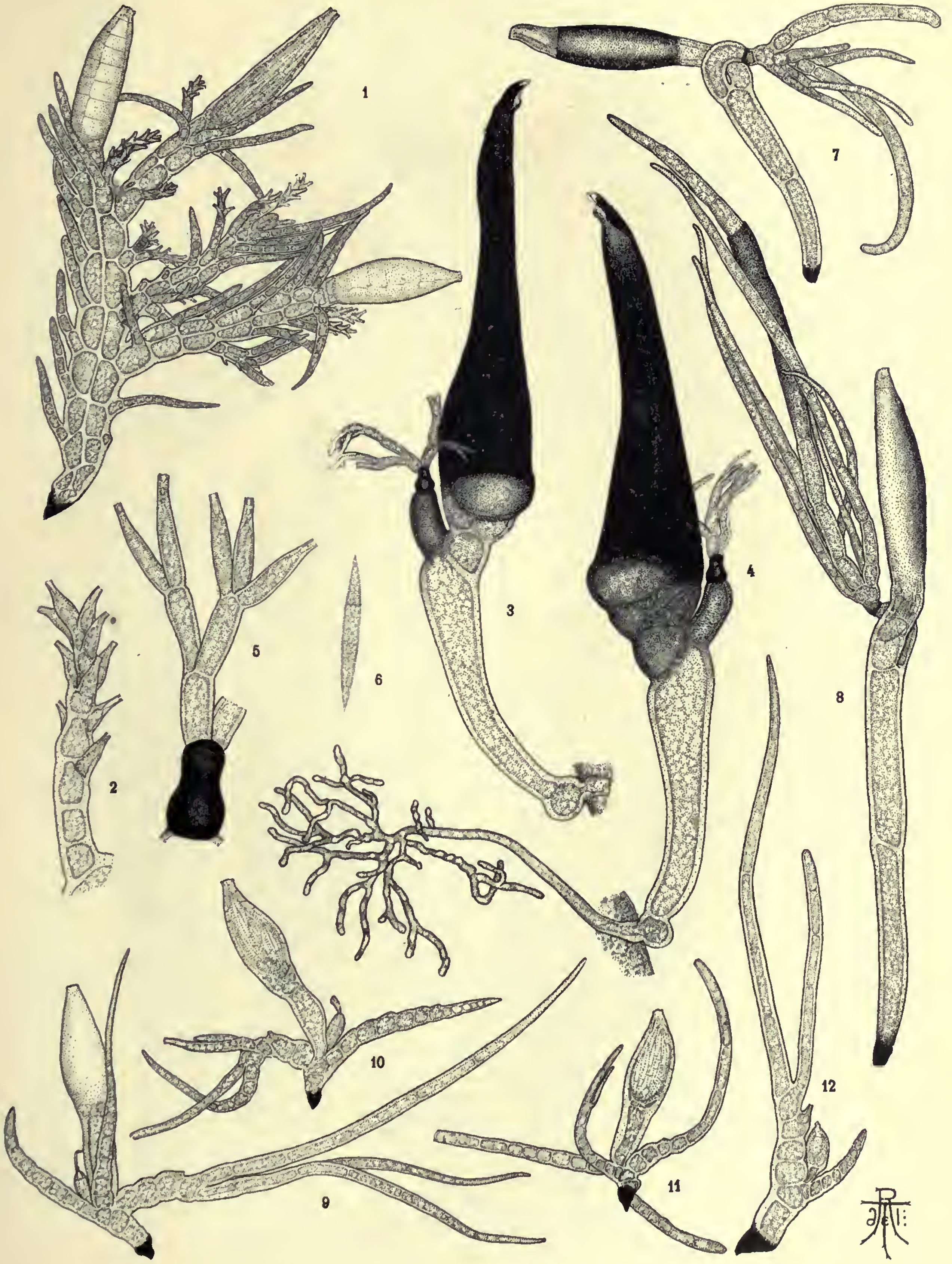


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

16-17 - Dioichomyces obliquesep
18-25 - D. anthici
D. onchophorus

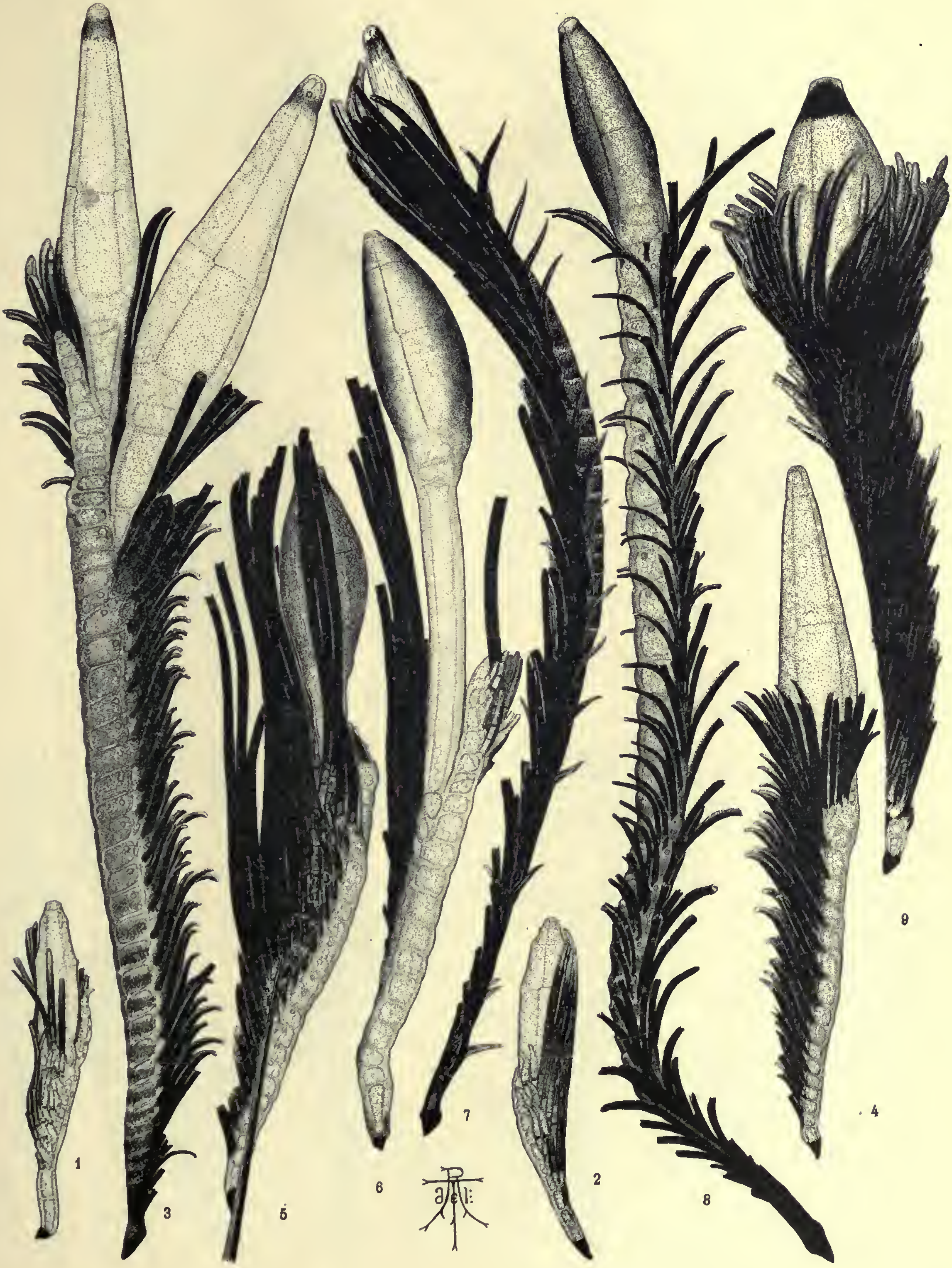
Clematomyces Pinophili	1-2	p. 427
Ceraiomyces Dahlii	3-6	p. 327
Ceraiomyces Selenae	7-8	p. 327
Compsomyces Lestevi	9-12	p. 428



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Rhacomyces Canariensis	1-2	p. 421
Rhacomyces Philonthinus	3-4	p. 424
Rhacomyces stipitatus	5-6	p. 422
Rhacomyces tenuis	7	p. 426
Rhacomyces Dolicaontis	8	p. 425
Rhacomyces velatus	9	p. 426

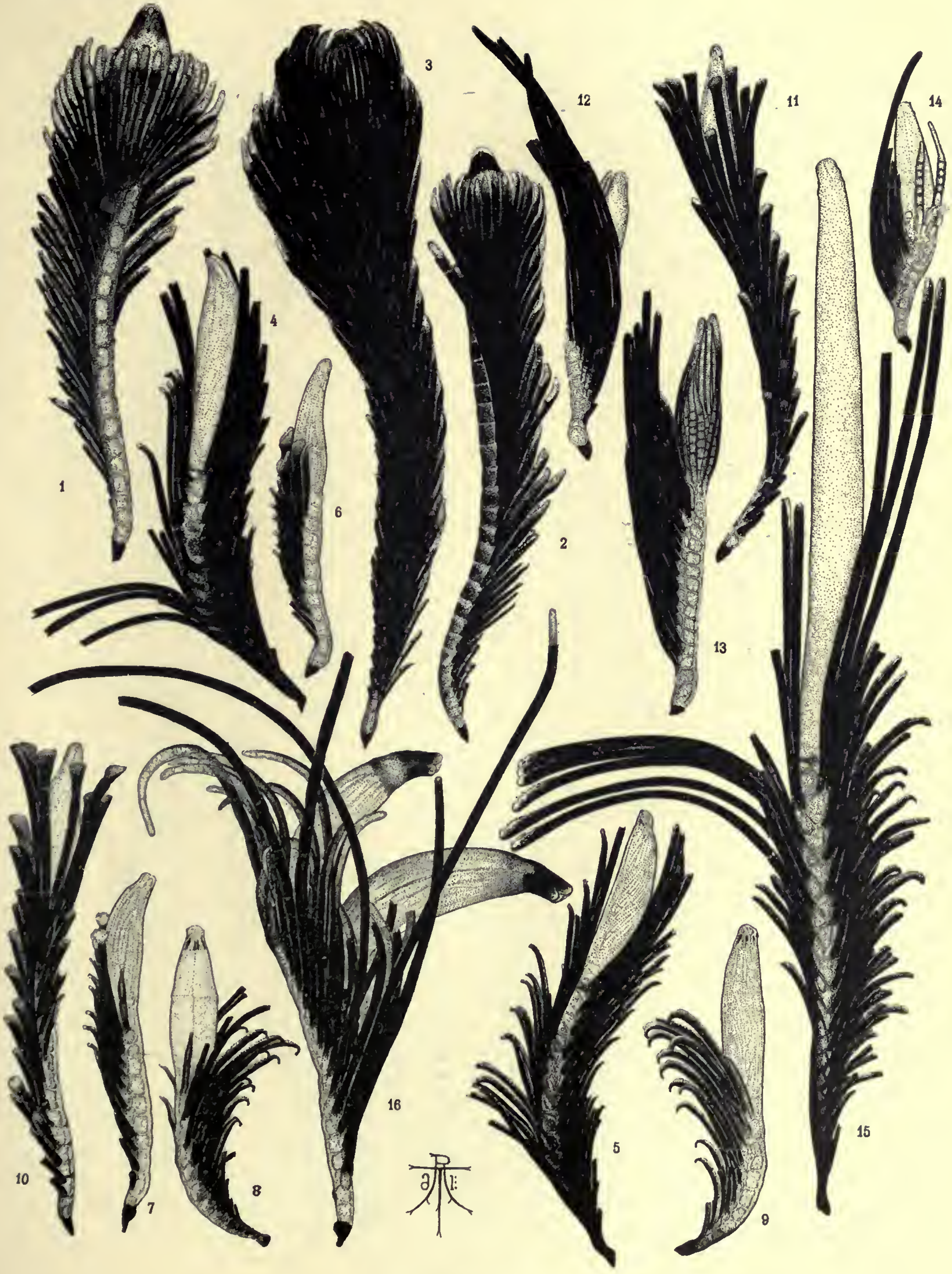


COCKAYNE, BOSTON.

THAXTER,— LABOULBENIACEAE

Rhacomyces Javanicus	1-2	p. 426
Rhacomyces velatus	3	p. 426
Rhacomyces Cayennensis	4-5	p. 423
Rhacomyces Thalpii	6-7	p. 421
Rhacomyces Oedichiri	8-9	p. 424
Rhacomyces Zuphii	10-11	p. 421
Rhacomyces Aphaenopsis	12-14	p. 422
Rhacomyces Cryptobiarum	15	p. 424
Rhacomyces Glyptomerae	16	p. 423

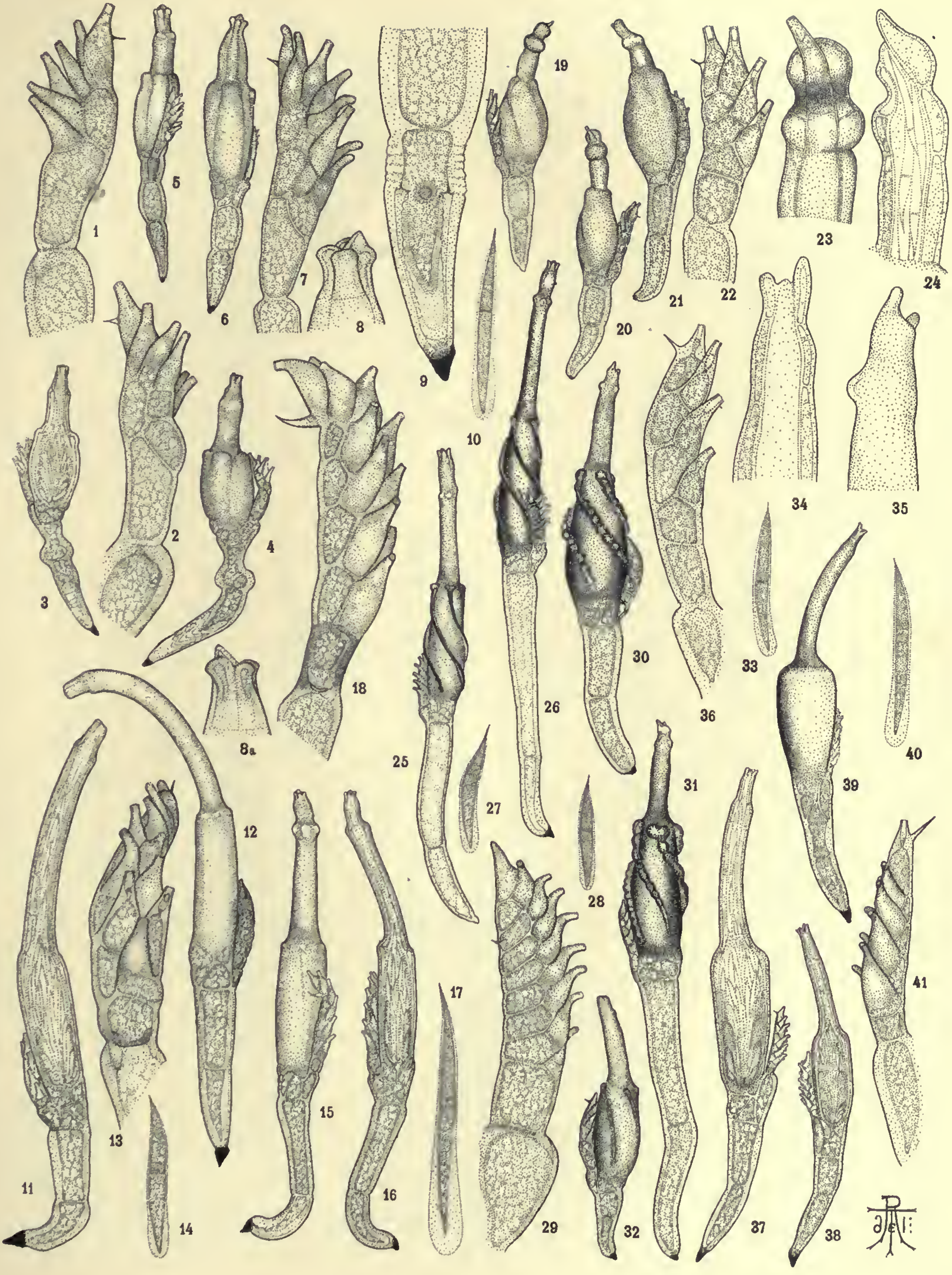
PLATE XLV



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

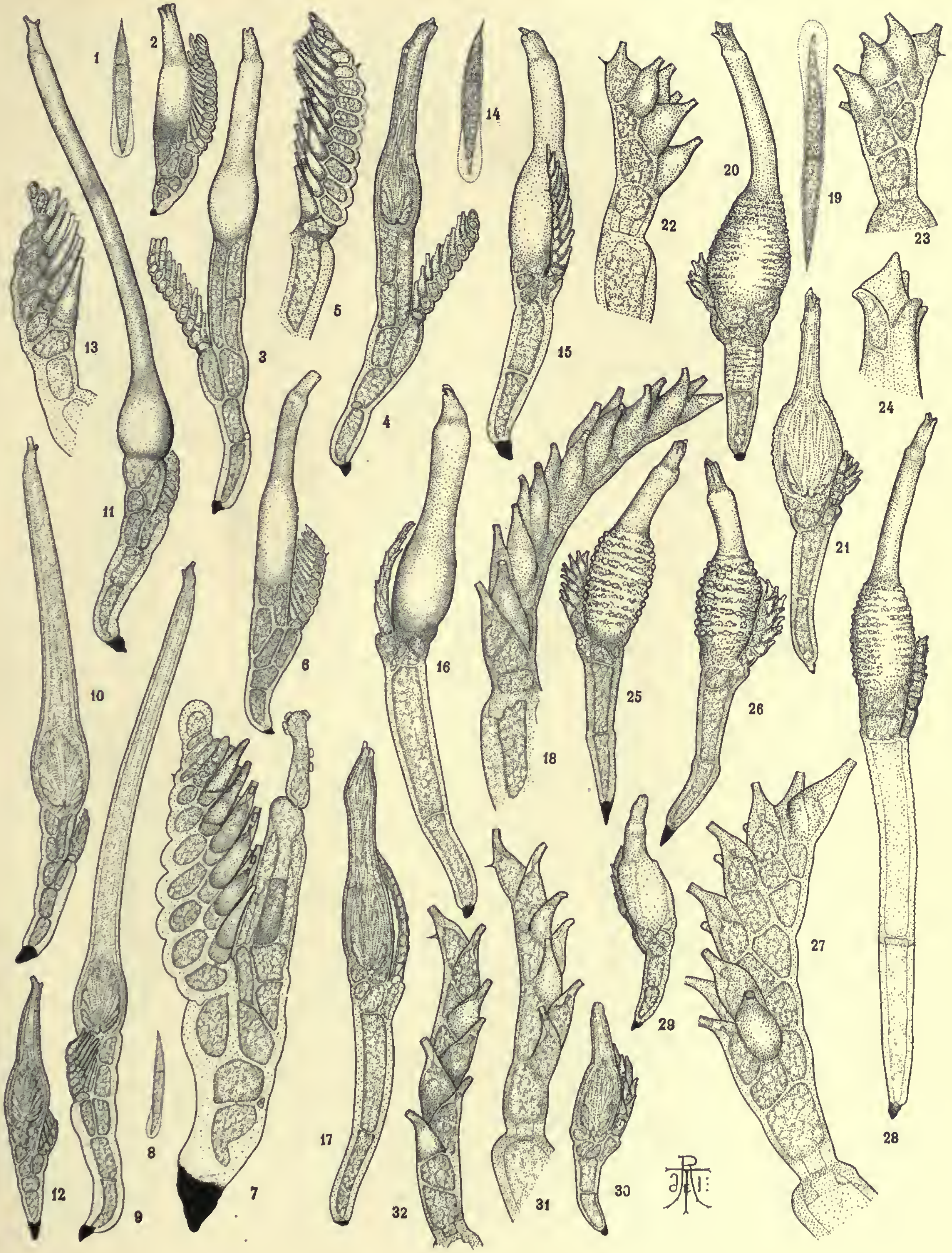
Stigmatomyces constrictus	1-4	p. 307
Stigmatomyces Elachipterae	5-10	p. 308
Stigmatomyces proboscideus	11-14	p. 308
Stigmatomyces gracilis	15-18	p. 305
Stigmatomyces Hydrelliae	19-24	p. 303
Stigmatomyces spiralis	25-29	p. 303
Stigmatomyces purpureus	30-36	p. 302
Stigmatomyces Scaptomyzae	37-41	p. 305.



COCKAYNE, BOSTON

THAXTER.—LABOULBENIACEAE

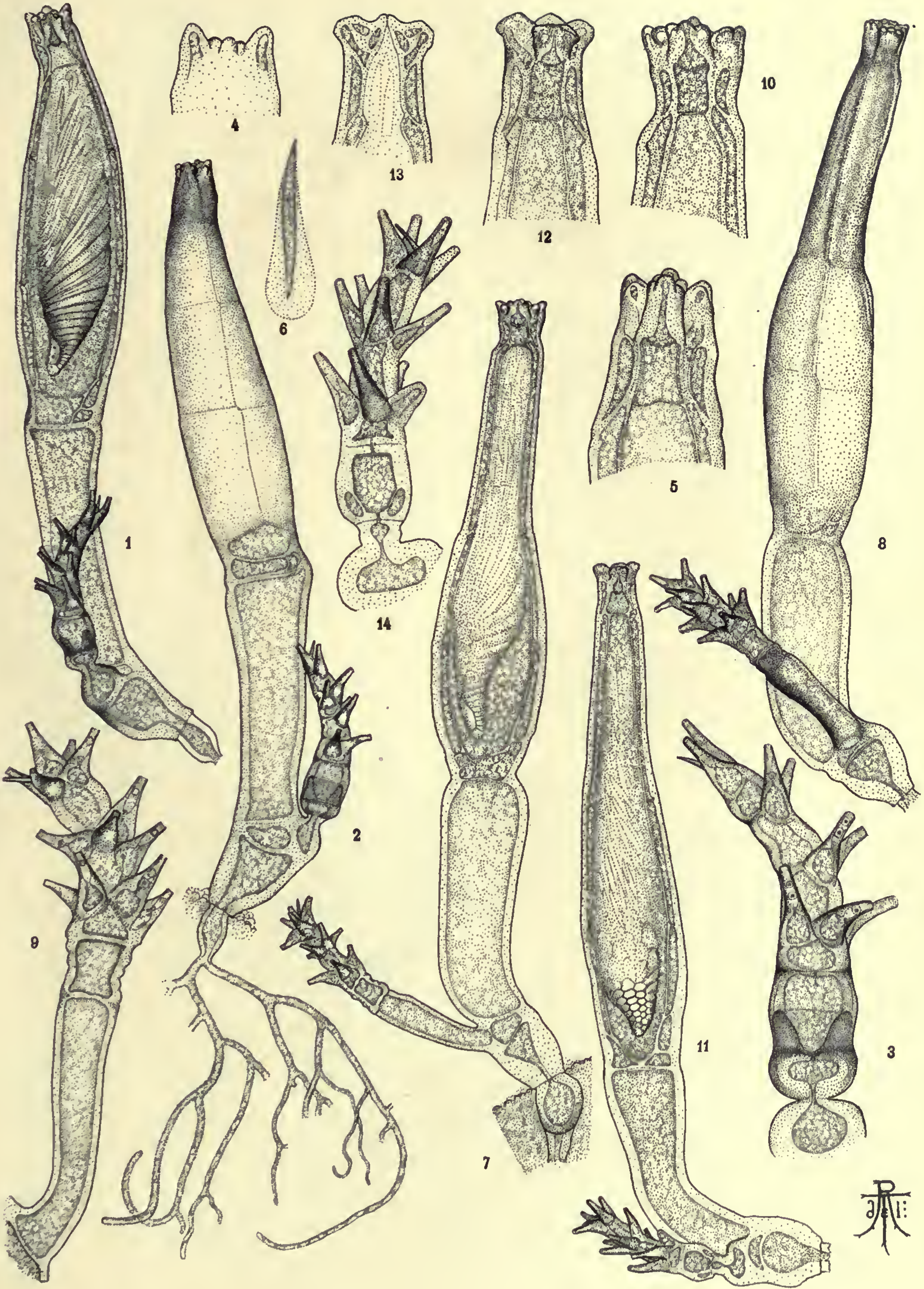
Stigmatomyces Limosinae	1-7	p. 311
Stigmatomyces Papuanus	8-13	p. 311
Stigmatomyces dubius	14-18	p. 310
Stigmatomyces micrandrus	19-24	p. 306
Stigmatomyces rugosus	25-28	p. 307
Stigmatomyces humilis	29-32	p. 310



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

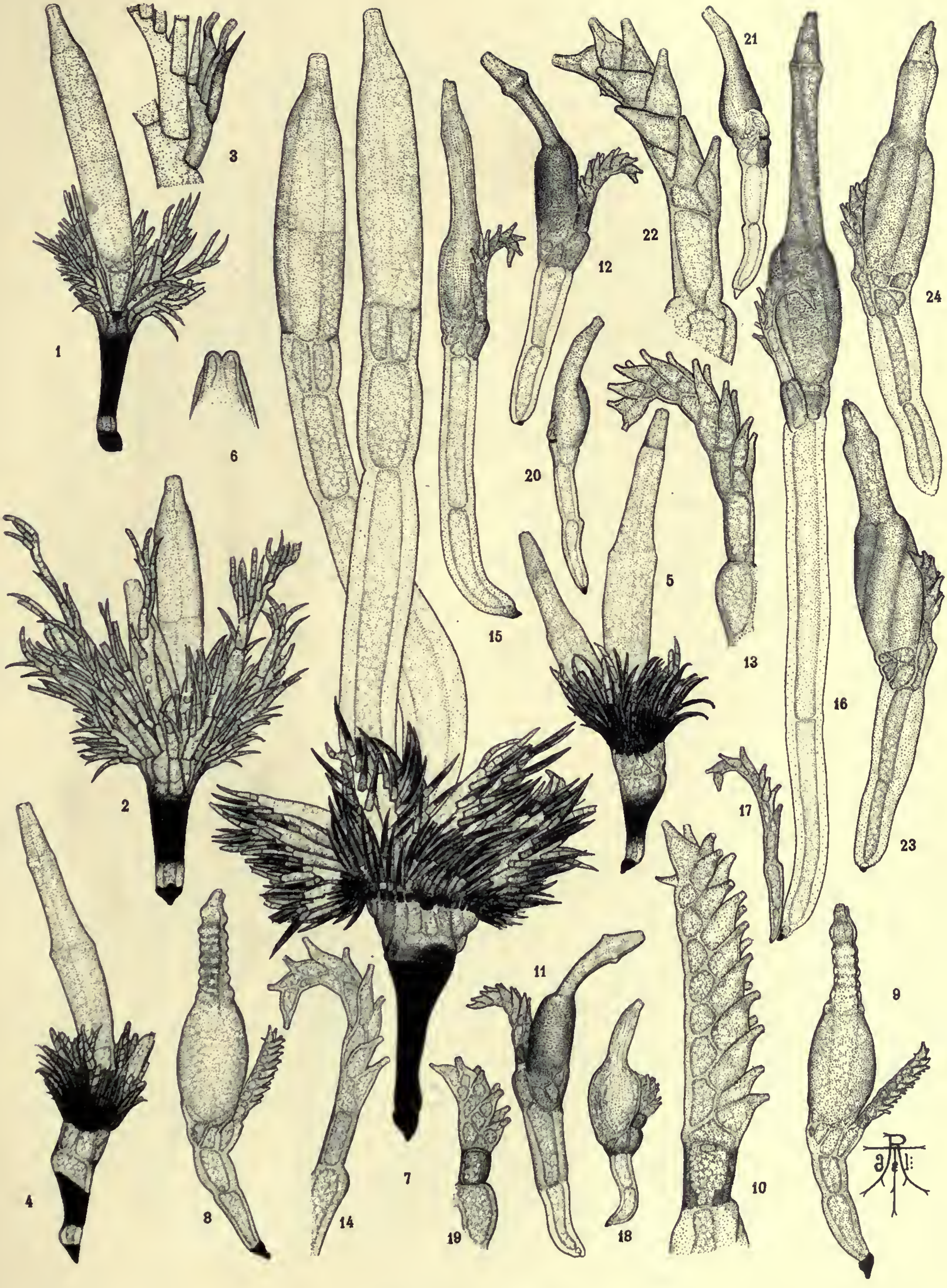
Arthrorhynchus Cyclopodiae	1-6	p. 313
Arthrorhynchus Nycteribiae	7-10	p. 313
Arthrorhynchus Eucampsipodae	11-14	p. 314



COCKAYNE, BOSTON.

THAXTER,—LABOULBENIACEAE

Peratomyces Zealandica	1-3 p. 316
Peratomyces Philonthi	4-5 p. 316
Peratomyces petiolatus	6-7 p. 316
Stigmatomyces Diopsis	8-10 p. 304
Stigmatomyces Limnophorae	11-13 p. 309
Stigmatomyces Sarcophagae	14-17 p. 309
Stigmatomyces pauperculus	18-19 p. 306
Stigmatomyces Venezuelae	20-21 p. 304
Stigmatomyces Baeri	22-24 p. 309



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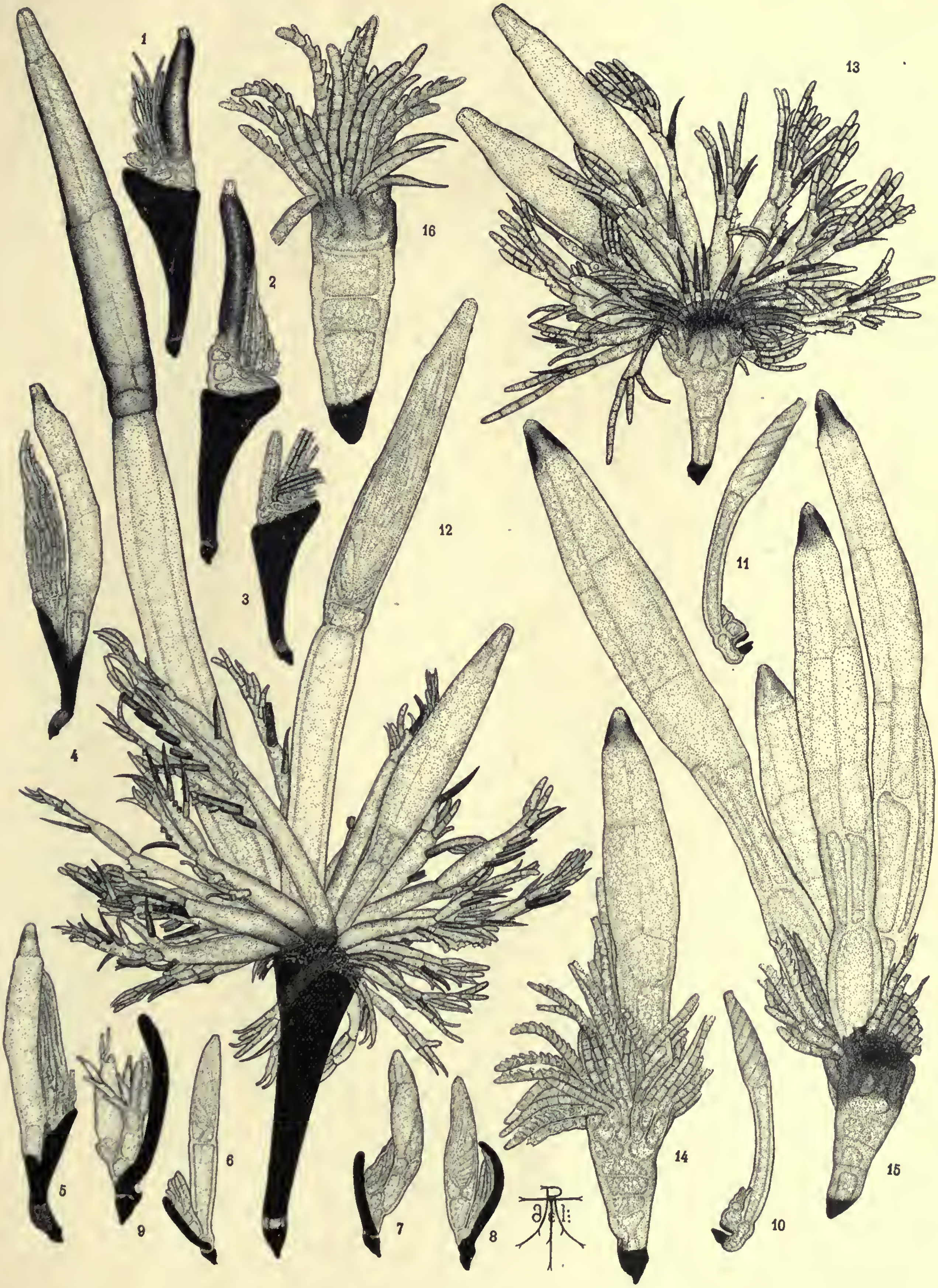
THAXTER,—LABOULBENIACEAE

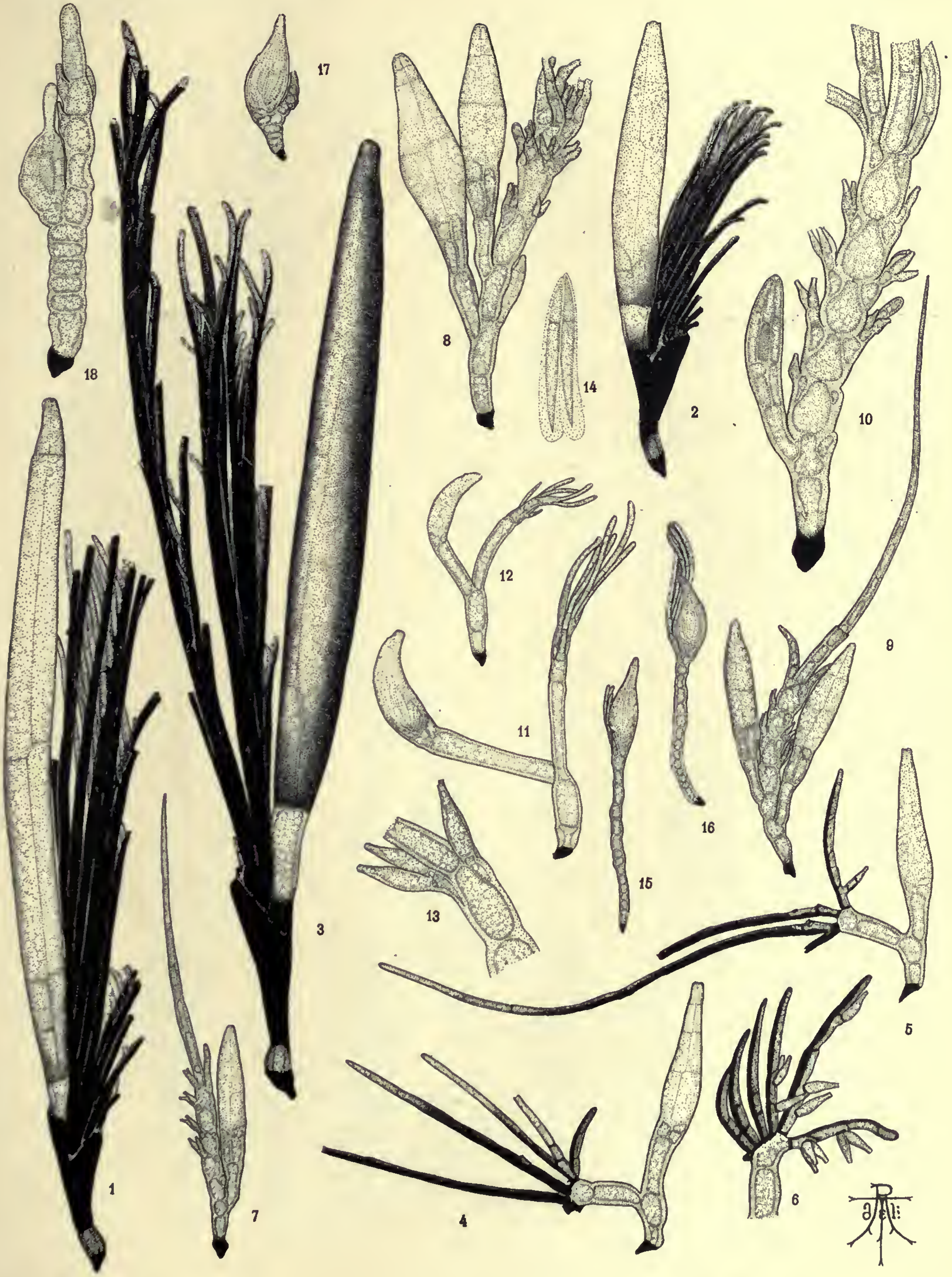
Sphaleromyces Latonae	1-3	p. 326
Corethromyces purpurascens	4-5	p. 318
Corethromyces Stilici	6-9	p. 319
Corethromyces longicaulis	10-11	p. 319
Teratomyces insignis	12-13	p. 317
Symplectromyces vulgaris	14-16	p. 315



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

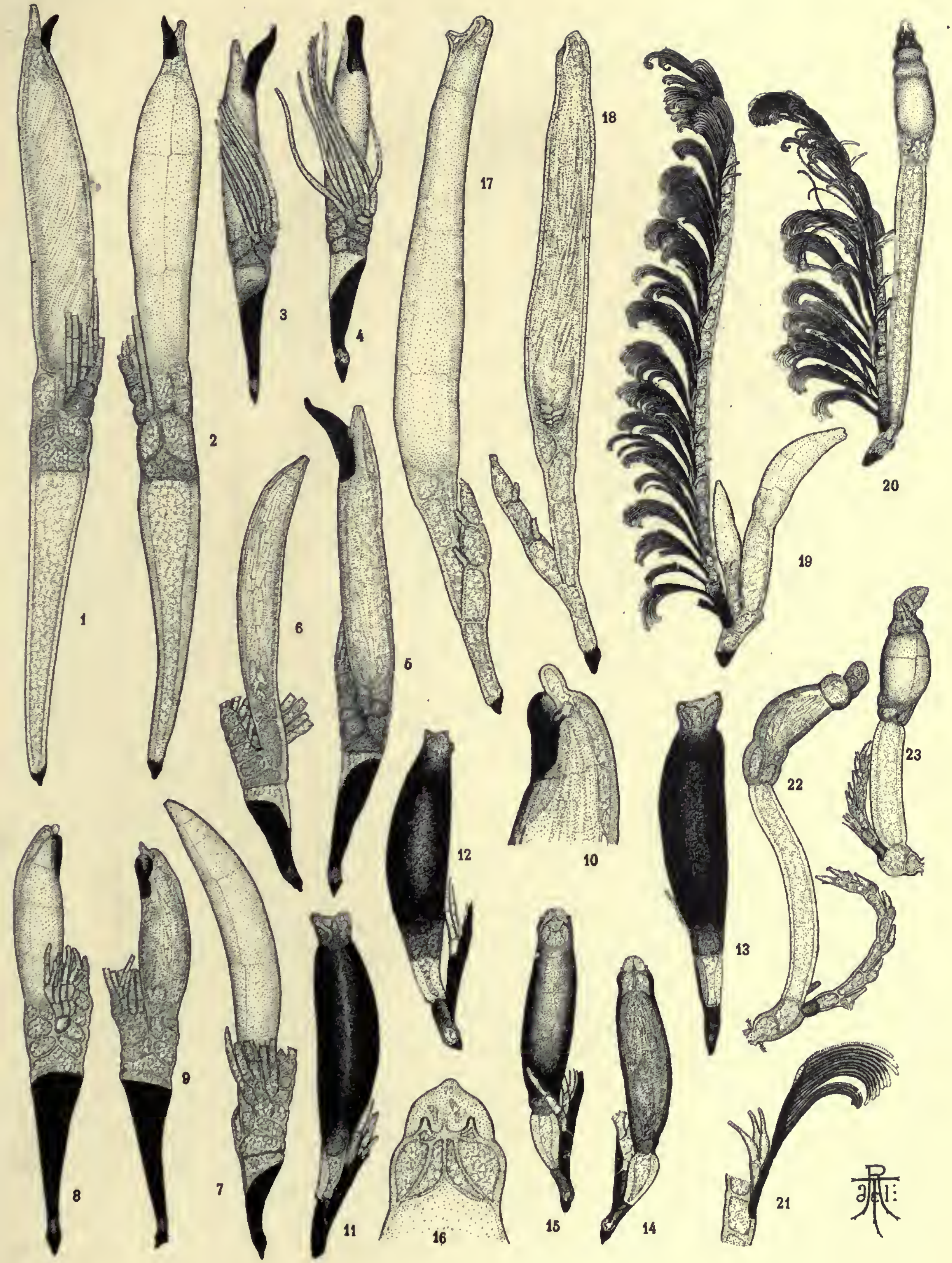
Corethromyces Brazilianus	1-2	p. 318
Corethromyces Cryptobii	3	p. 318
Eucorethromyces Apotomi	4-6	p. 320
Stichomyces Conosomae	7-10	p. 321
Stichomyces Stilocolus	11-14	p. 321
Ecteinomyces Trichopterophilus	15-18	p. 429



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Sphaleromyces Chiriquensis	1-2	p. 325
Sphaleromyces Brachyderi	3-5	p. 324
Sphaleromyces atropurpureus	6-7	p. 324
Sphaleromyces Quedionuchi	8-10	p. 325
Sphaleromyces obtusus	11-13	p. 326
Sphaleromyces propinquus	14-16	p. 326
Sphaleromyces Indicus	17-18	p. 324
Rhizomyces crispatus	19-21	p. 323
Rhizomyces gibbosus	22-23	p. 322

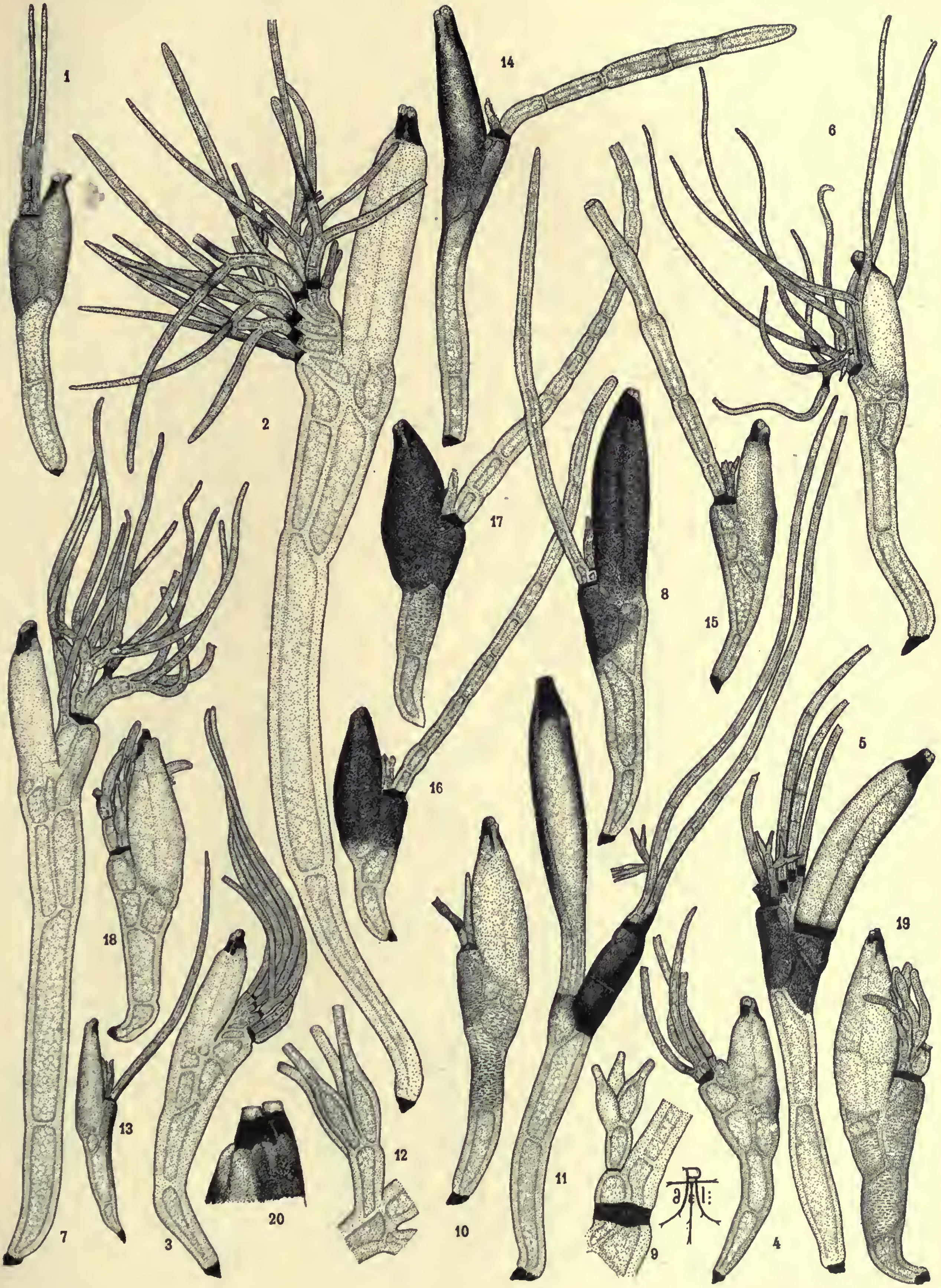


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia exigua	1	p. 333
Laboulbenia proliferans var. atrata	2	p. 332
Laboulbenia proliferans var. interposita	3-4	p. 332
Laboulbenia proliferans var. cincta	5	p. 332
Laboulbenia proliferans var. divaricata	6-7	p. 333
Laboulbenia Craspedophori	8-9	p. 333
Laboulbenia humilis	10	p. 334
Laboulbenia Brachionychi	11-12	p. 334
Laboulbenia subterranea	13-15	p. 335
Laboulbenia Atlantica	16-17	p. 336
Laboulbenia bidentata	18-20	p. 344

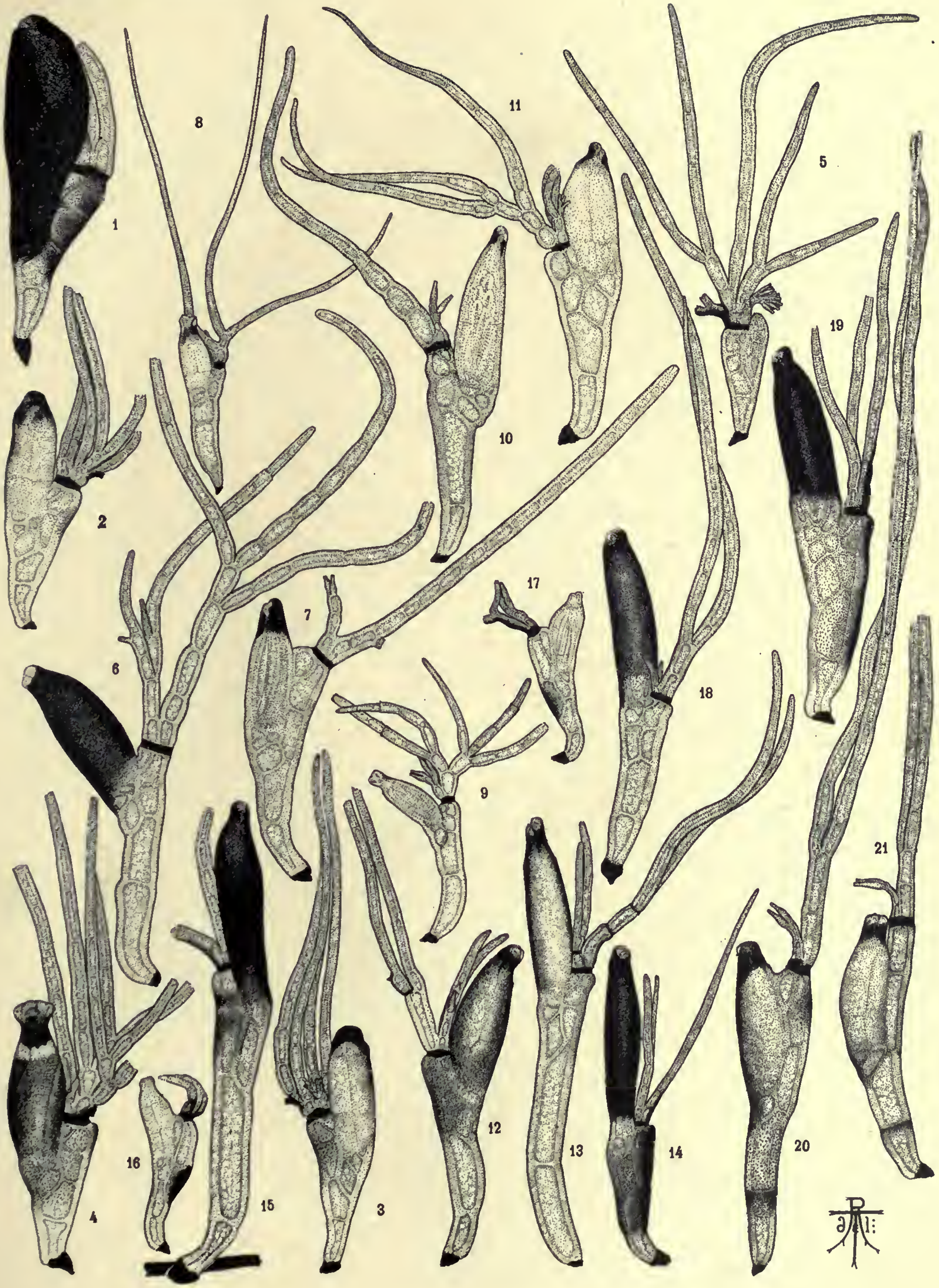
PLATE LIII.



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia	obtusa	1	p. 341
"	intermedia	2-3	p. 340
"	Aerogenidii	4-5	p. 340
"	Pseudomasci	6	p. 343
"	Madeirae	7	p. 337
"	pallida	8-9	p. 340
"	Oedodactyli.	10	p. 336
"	Ophoni	11	p. 339
"	Oopteri	12	p. 343
"	Copteae	13	p. 343
"	Orthomi	14-15	p. 337
"	Stomonaxi	16-17	p. 350
"	melanaria	18	p. 338
"	Dryptae	19	p. 338
"	erecta	20-21	p. 337

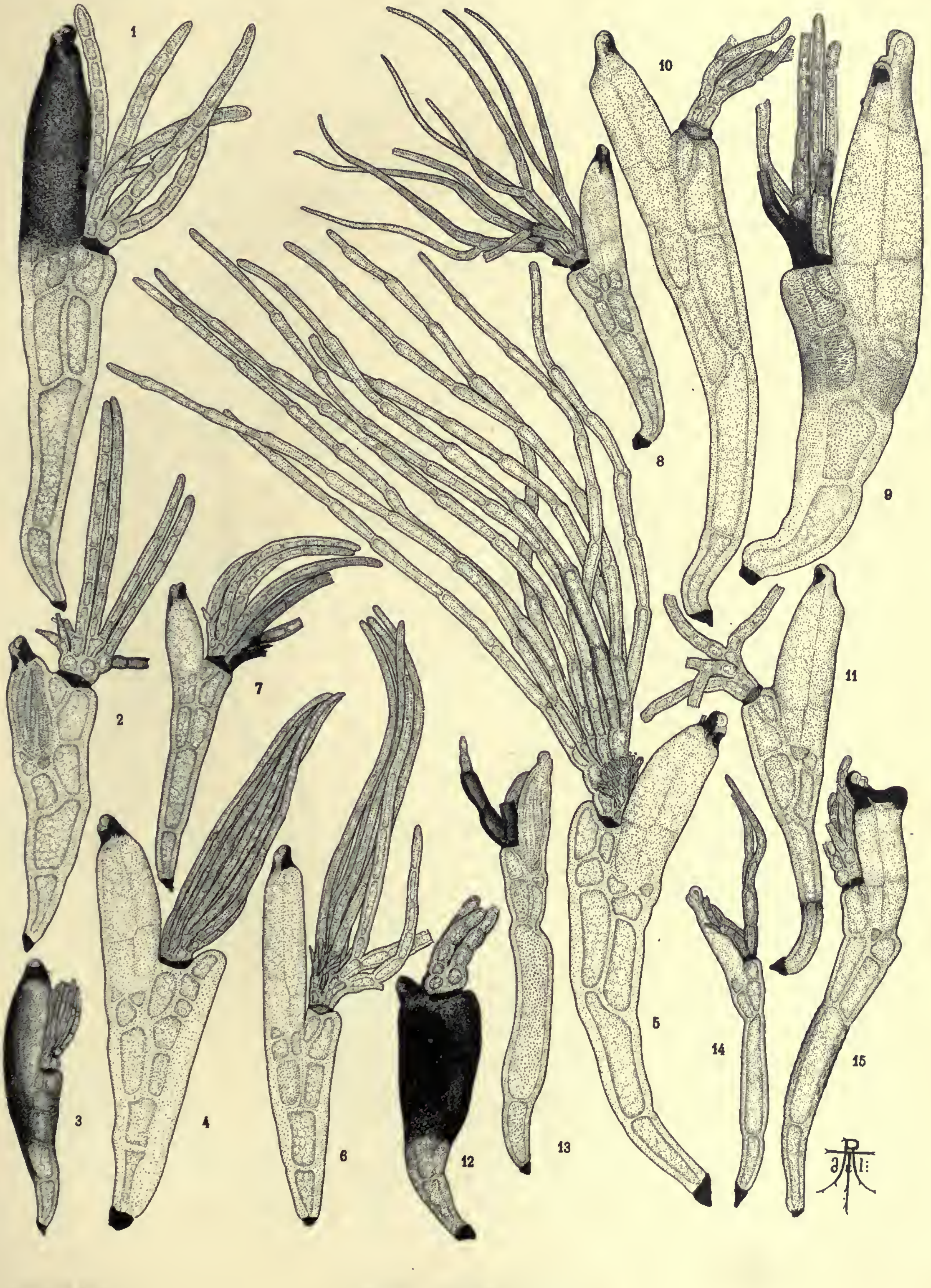


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia	dubia	1 p. 353
"	Darwinii	2 p. 402
"	olivacea	3 p. 360
"	Anaplogenii	4-5 p. 348
"	Platyprosopi	6 p. 347
"	Rougetii var. Japanensis	7 p. 352
"	Rougetii var Chinensis	8 p. 352
"	bilabiata	9 p 352
"	Anchonoderi	10-11 p. 347
"	Pericalli	12 p. 382
"	Euchilae	13-14 p. 376
"	Thyreopteri	15 p. 380

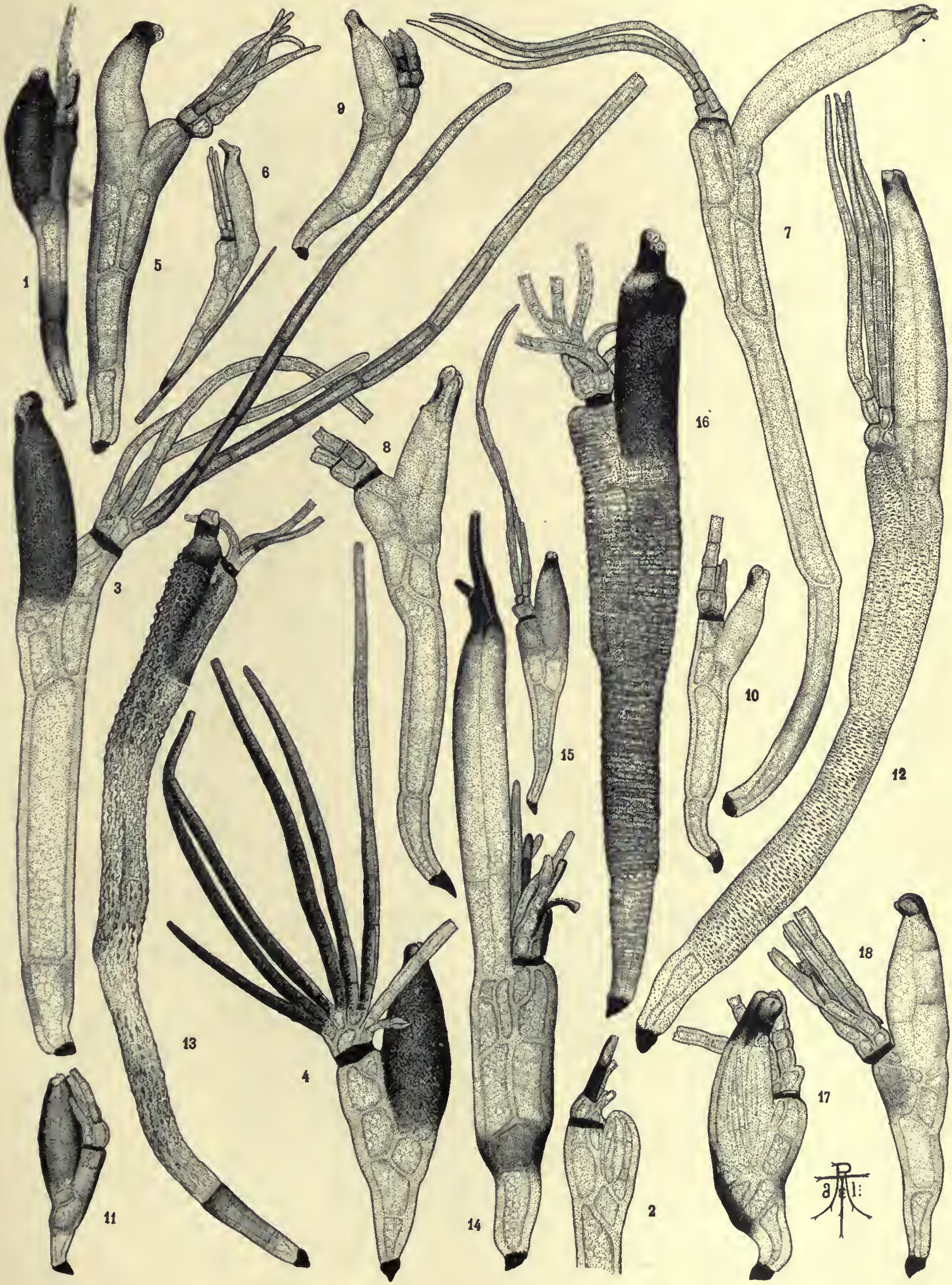
PLATE LV.



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

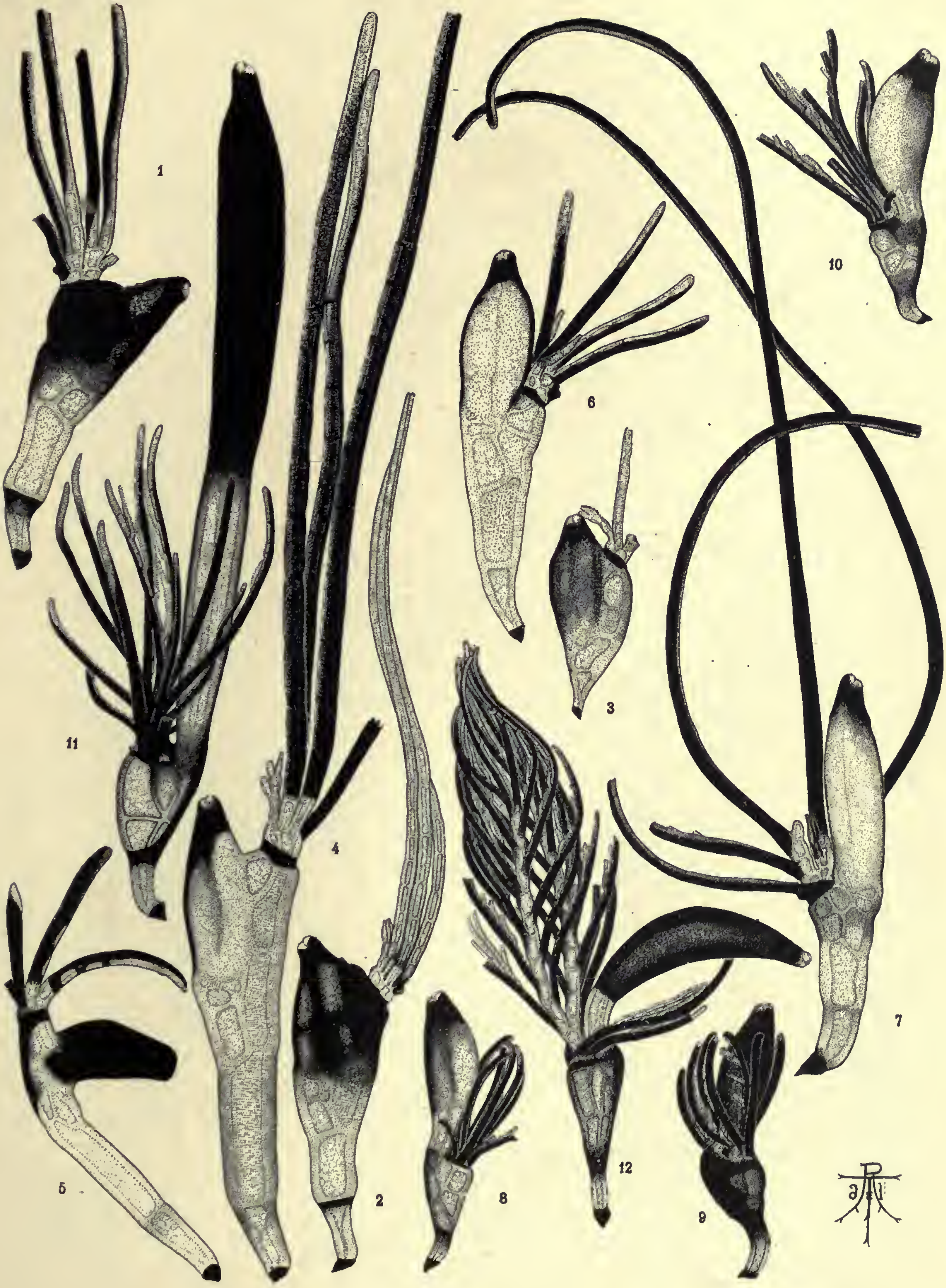
Laboulbenia	insularis	1-2	p. 335
"	Latonae	3-4	p. 353
"	Loxandri	5	p. 357
"	Columbiana	6-7	p. 358
"	pedicillata	11	p. 344
"	Egae	12	p. 357
"	notata	13	p. 378
"	acanthophora	14	p. 372
"	Tachyis	15	p. 360
"	verrucosa	16	p. 348
"	microscopica	17	p. 359
"	Chiriquensis	18	p. 356



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

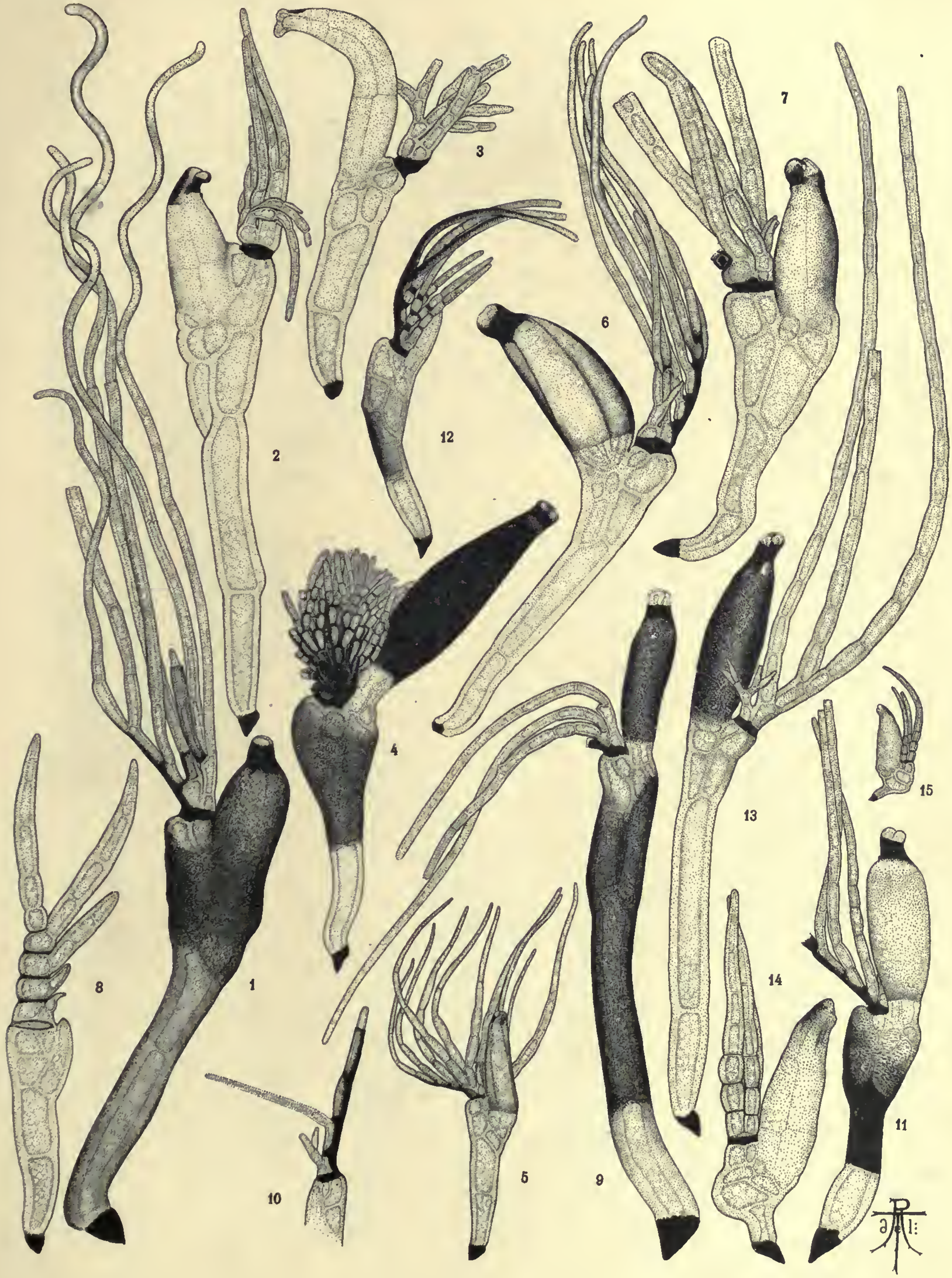
Laboulbenia	Hawaiiensis	1-3	p. 383
"	sphyriopsis	5	p. 385
"	Disenochi	4 and 6-7	p. 384
"	cauliculata	8-10	p. 385
"	cauliculata var. prolixa	11	p. 386
"	cauliculata var spectabilis	12	p. 386



COCKAYNE, BOSTON.

THAXTER,—LABOULBENIACEAE

Laboulbenia	spiralis	1	p. 348
"	megalonychi	2	p. 374
"	obliquata	3	p. 375
"	concinna	4	p. 366
"	flaccida	5	p. 349
"	Planetis	6	p. 351
"	Eudaliae	7-8	p. 357
"	Ceylonensis	9-10	p. 349
"	Helluodis	11-12	p. 350
"	Taenodemae	13.	p. 346
"	Formicarum	14-15	p. 359

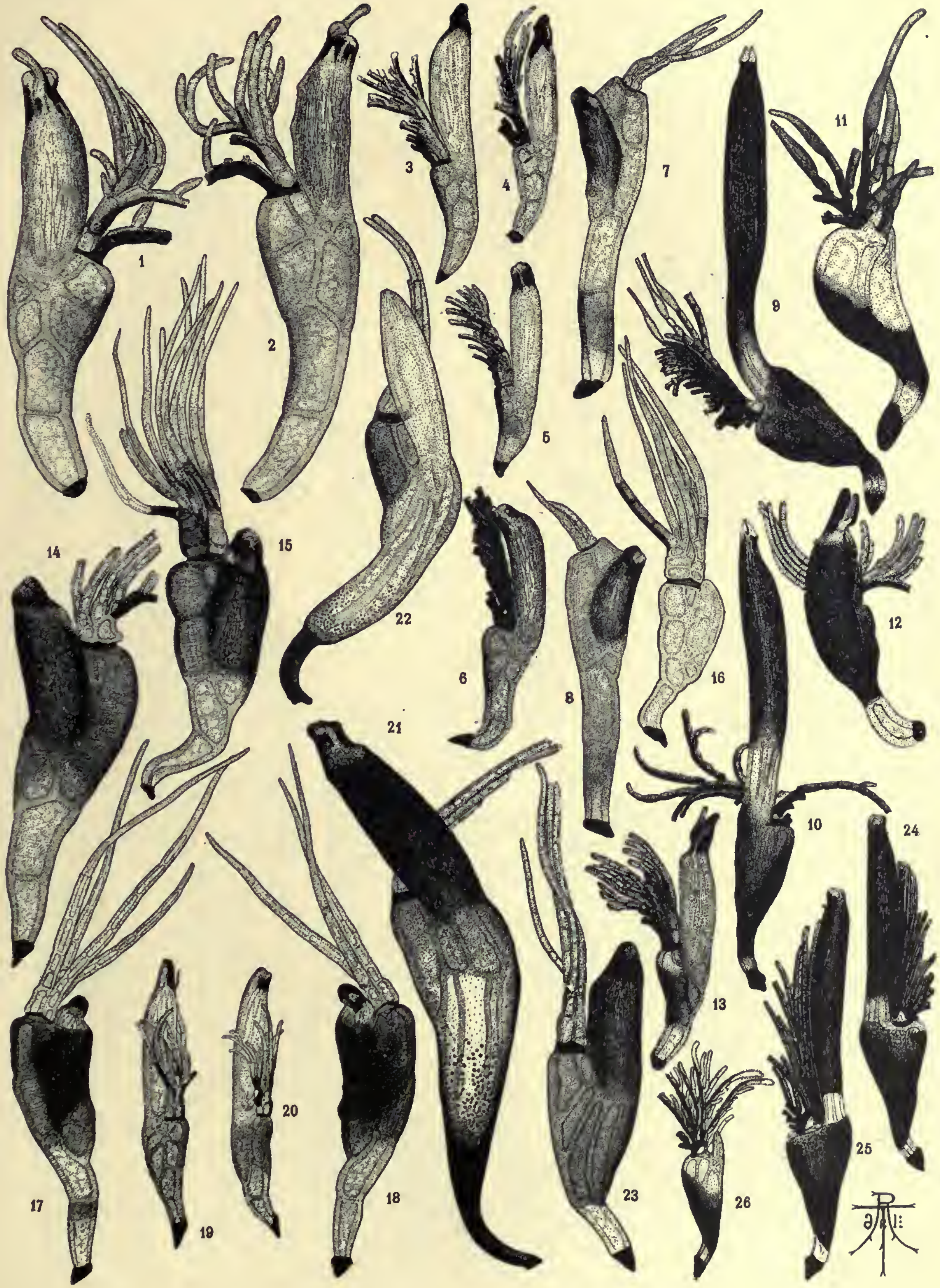


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia	separata	1-2	p. 369
"	corethropsis	3-6	p. 368
"	protrudens	7-8	p. 378
"	forficulata	9-11	p. 368
"	fissa	12-13	p. 367
"	prominens	14	p. 371
"	distincta	15-16	p. 372
"	Maylayensis	17-18	p 378
"	Misceli	19-20	p. 369
"	maculata	21-22	p. 381
"	Serrimarginis	23	p. 382
"	imitans	24-26	p. 367

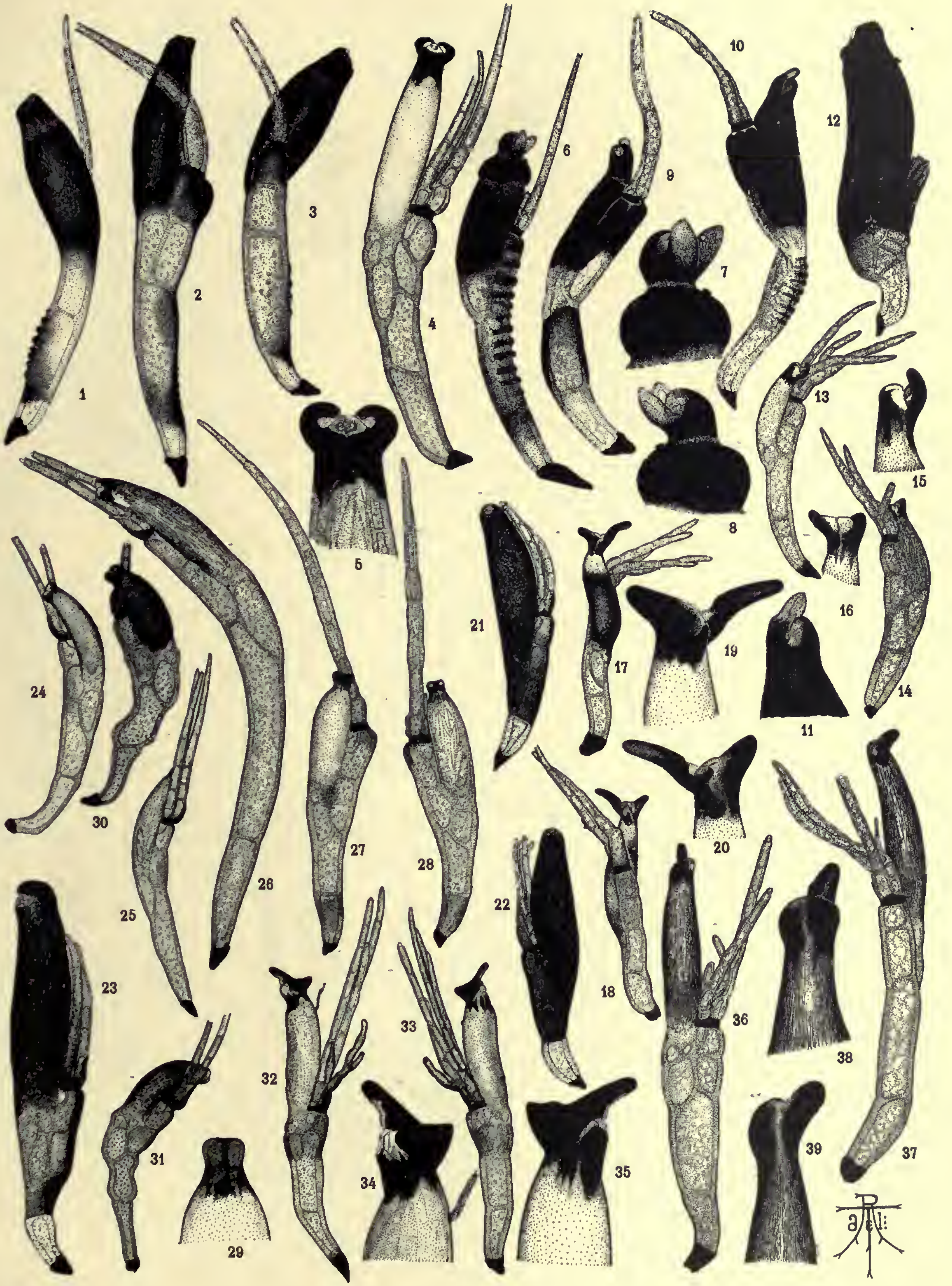
PLATE LIX.



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

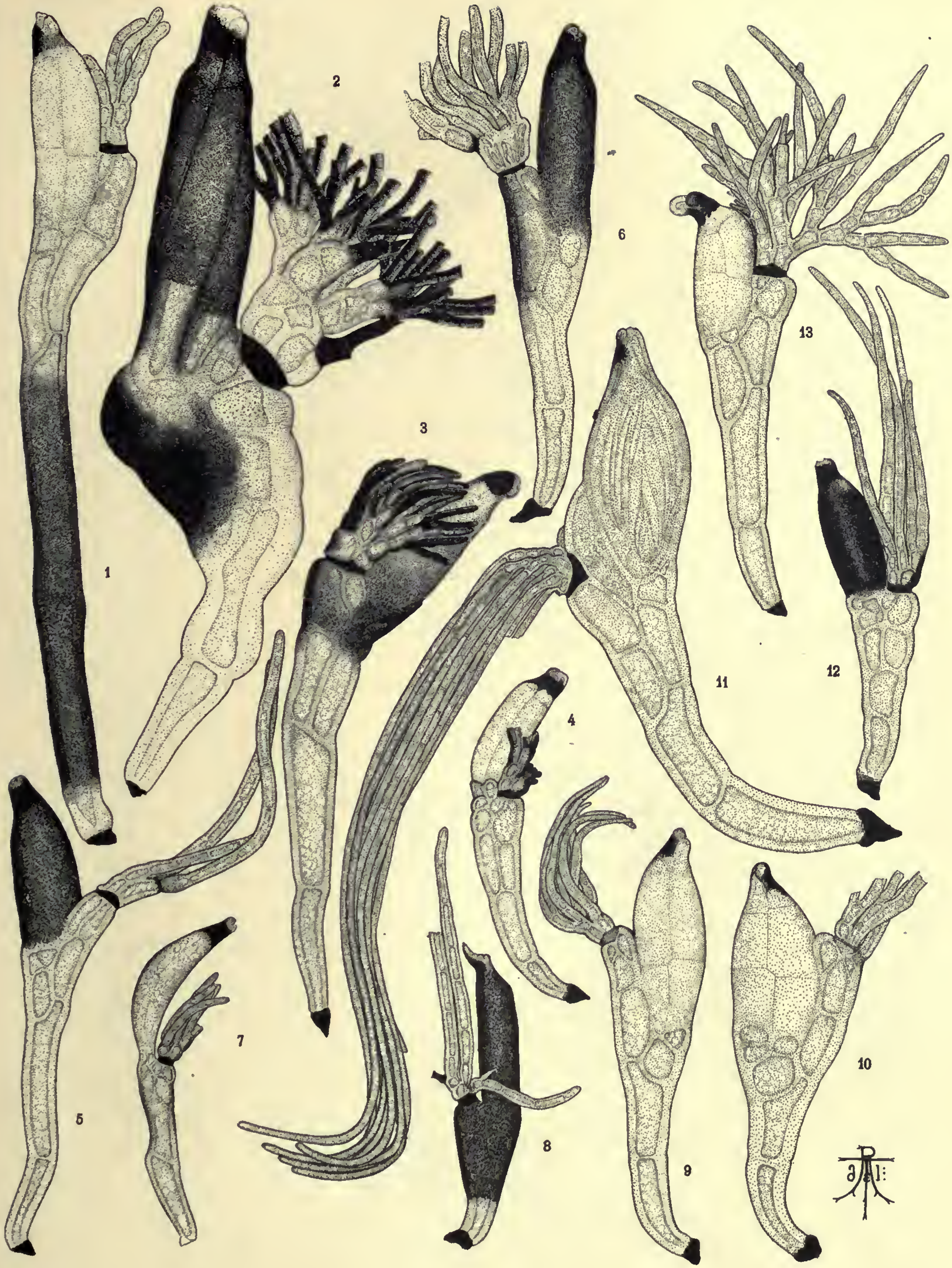
Laboulbenia	tuberculifera	1-3	p. 376
"	Platystoma	4-5	p. 379
"	corrugata	6-8	p. 377
"	leucophaea	9-11	p. 377
"	microsoma	12	p. 381
"	Sumatrae	13-16	p. 374
"	Javana	17-20	p. 373
"	finitima	21-23	p. 380
"	tenuis	24-26	p. 375
"	aristata	27-29	p. 379
"	subconstricta	30-31	p. 376
"	Ceratophora	32-35	p. 373
"	Assamensis	36-39	p. 373



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

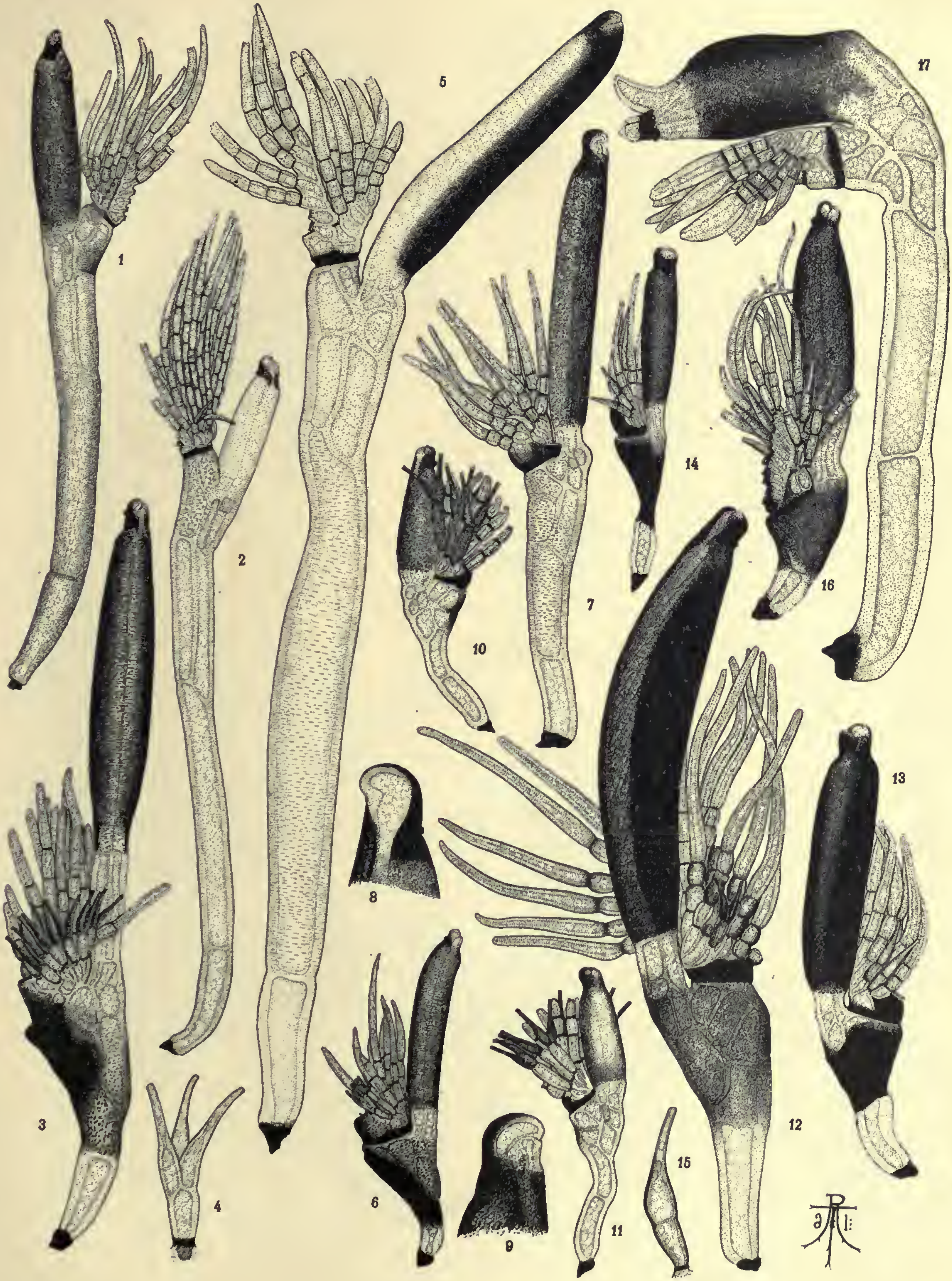
Laboulbenia	Papuana	1	p. 409
"	insignis	2	p. 370
"	Lebiae	3-4	p. 370
"	Clivinalis	5-6	p. 407
"	Oedichiri	7	p. 354
"	dentifera	8	p. 356
"	pallescens	9-10	p. 407
"	barbata	11	p. 408
"	Madagascarensis	12	p. 339
"	uncinata	13	p. 346



COCKAYNE, BOSTON.

THAXTER,—LABOULBENIACEAE

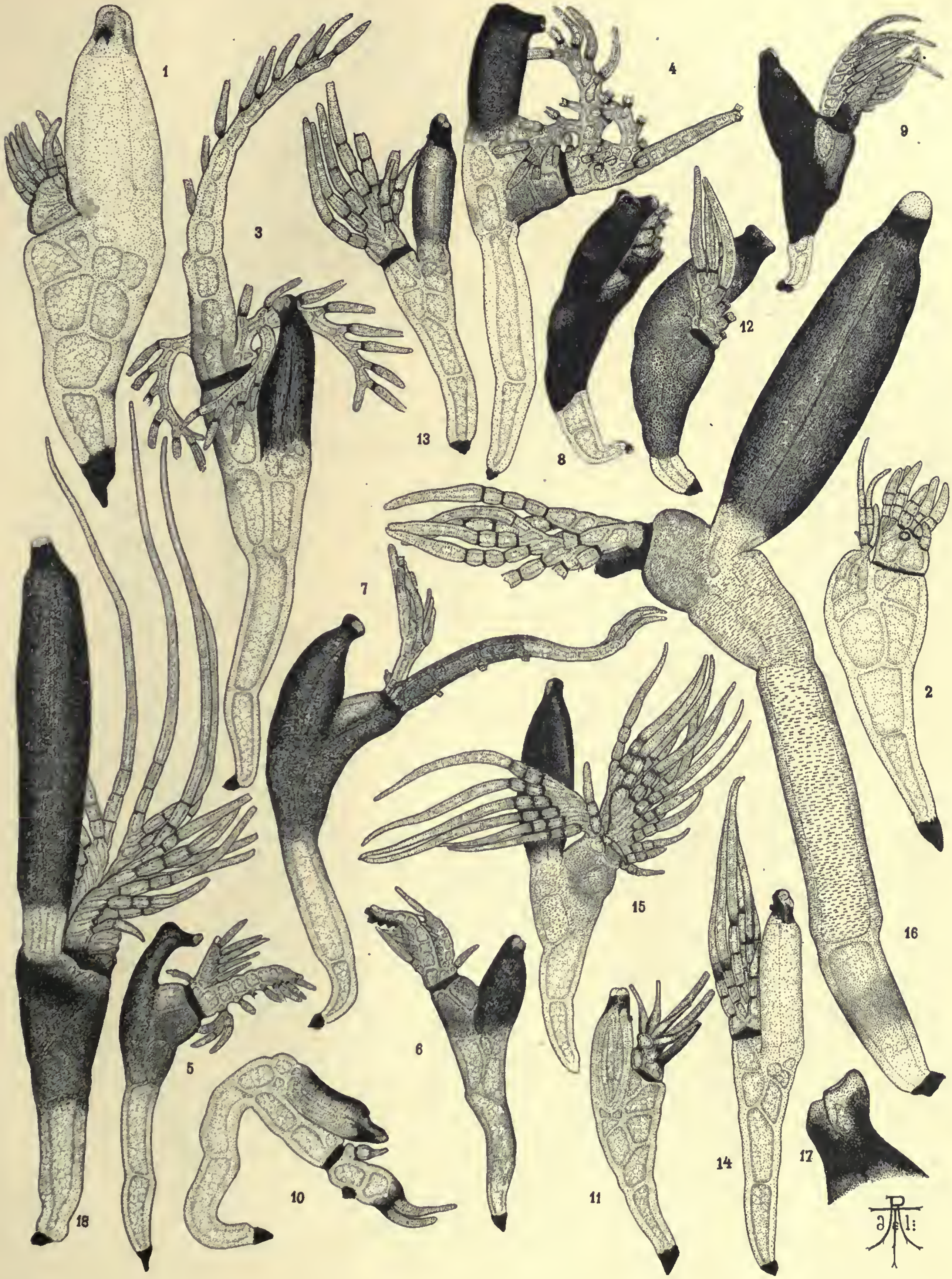
Laboulbenia	Tricognathi	1-2	p. 389
"	media	3-4	p. 400
"	speciosa	5	p. 388
"	pygmaea	6	p. 399
"	adunca	7-9	p. 390
"	minimalis	10-11	p. 393
"	curvata	12	p. 399
"	bicolor	13-15	p. 398
"	Colpodis	16	p. 398
"	corniculata	17	p. 388



COCKAYNE, BOSTON.

THAXTER,—LABOULBENIACEAE

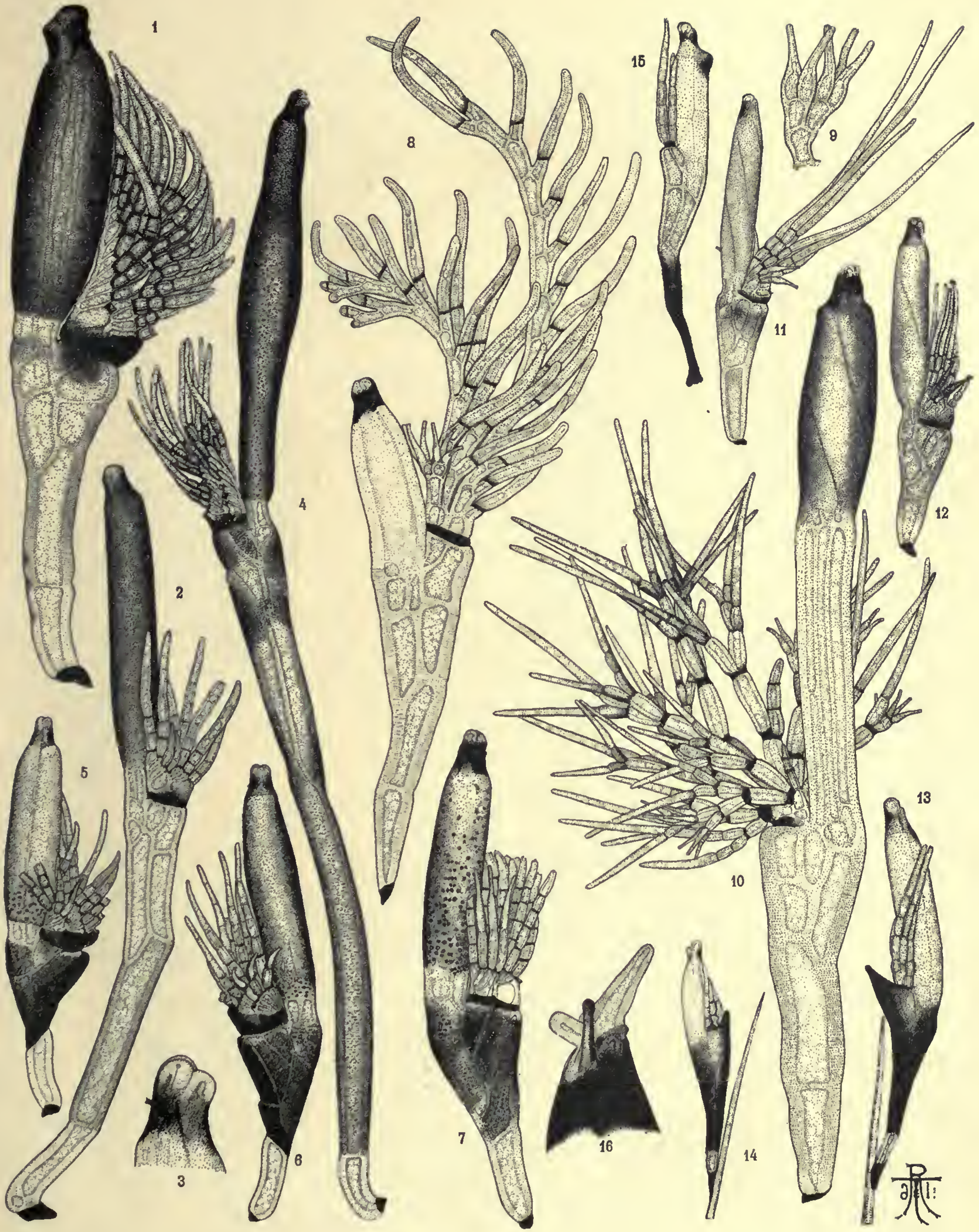
Laboulbenia	Cafii		1-2	p. 406.
"	Texana	var. pendula	3	p. 405.
"	"	" incurvata	4	p. 405
"	"	" rostellata	5	p. 404
"	"	" retusa	6	p. 406
"	"	" Oaxacana	7	p. 405
"	"	" tibialis	8-9	p. 406
"	tortuosa		10	p. 403
"	Ozenae		11	p. 403
"	punctulata		12	p. 402
"	Helluomorphae		13-14	p. 393
"	triordinata		15	p. 392
"	angularis		16-17	p. 387
"	perplexa		18	p. 396



COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia	incerta	1	p. 391
"	geniculata	2-3	p. 391
"	fusiformis	4	p. 396
"	subpunctata	5-6	p. 394
"	punctata	7	p. 395
"	Pheropsophi	8-9	p 401
"	longicollis	10	p. 363
"	decipiens	11-12	p. 397
"	producta	13-14	p. 361
"	Thyreopteri	15	p. 380
"	heterochila	16	p 416

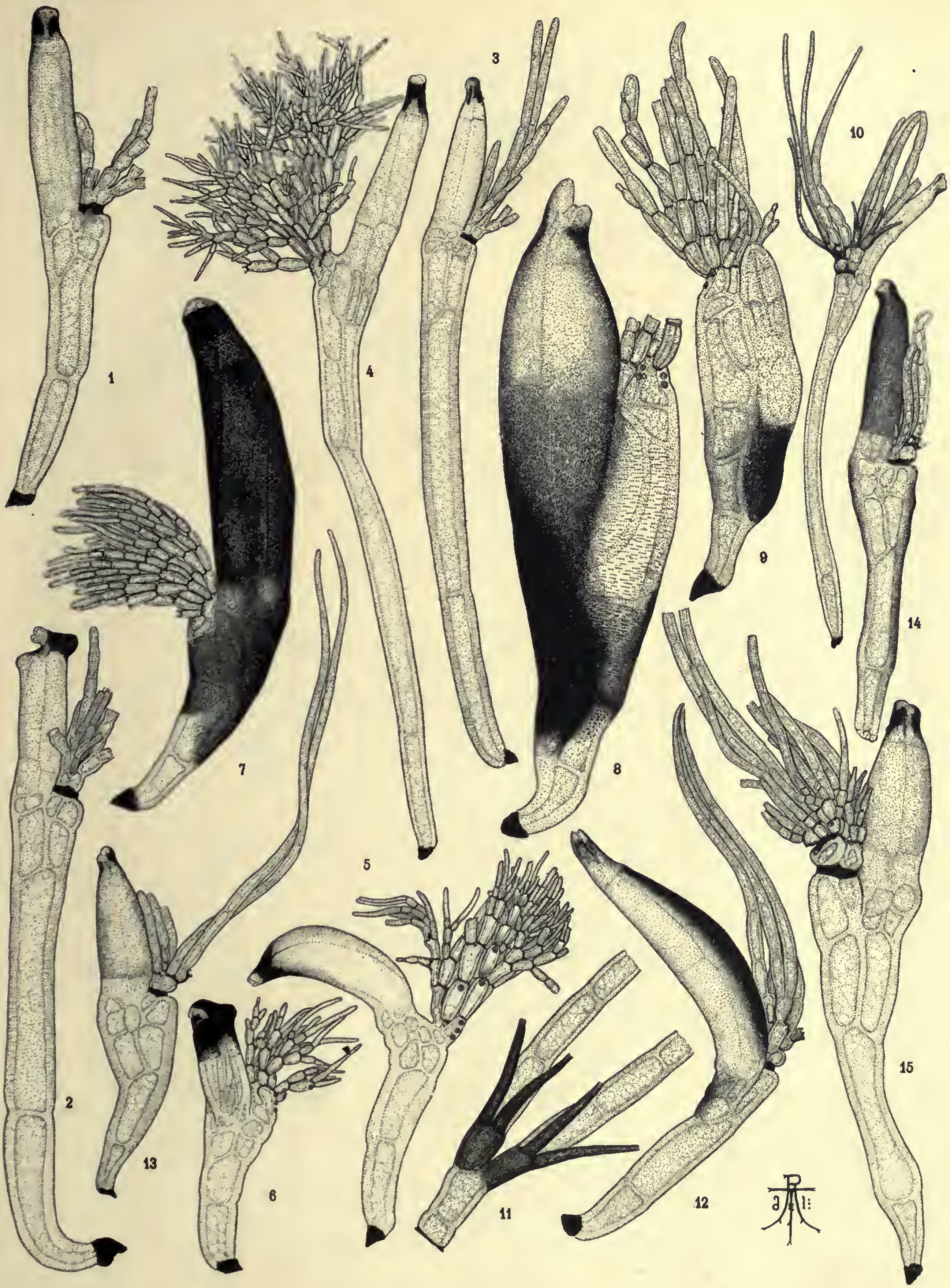


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia	Polyhirmae	1-3	p. 408
"	orientalis	4-5	p. 364
"	pusilla	6	p. 365
"	Japonica	7	p. 365
"	rhinophora	8-9	p. 366
"	equatorialis	10-11	p. 355
"	falcata	12	p. 355
"	celestialis	13-14	p. 361
"	Asiatica	15	p. 362

PLATE LXV.

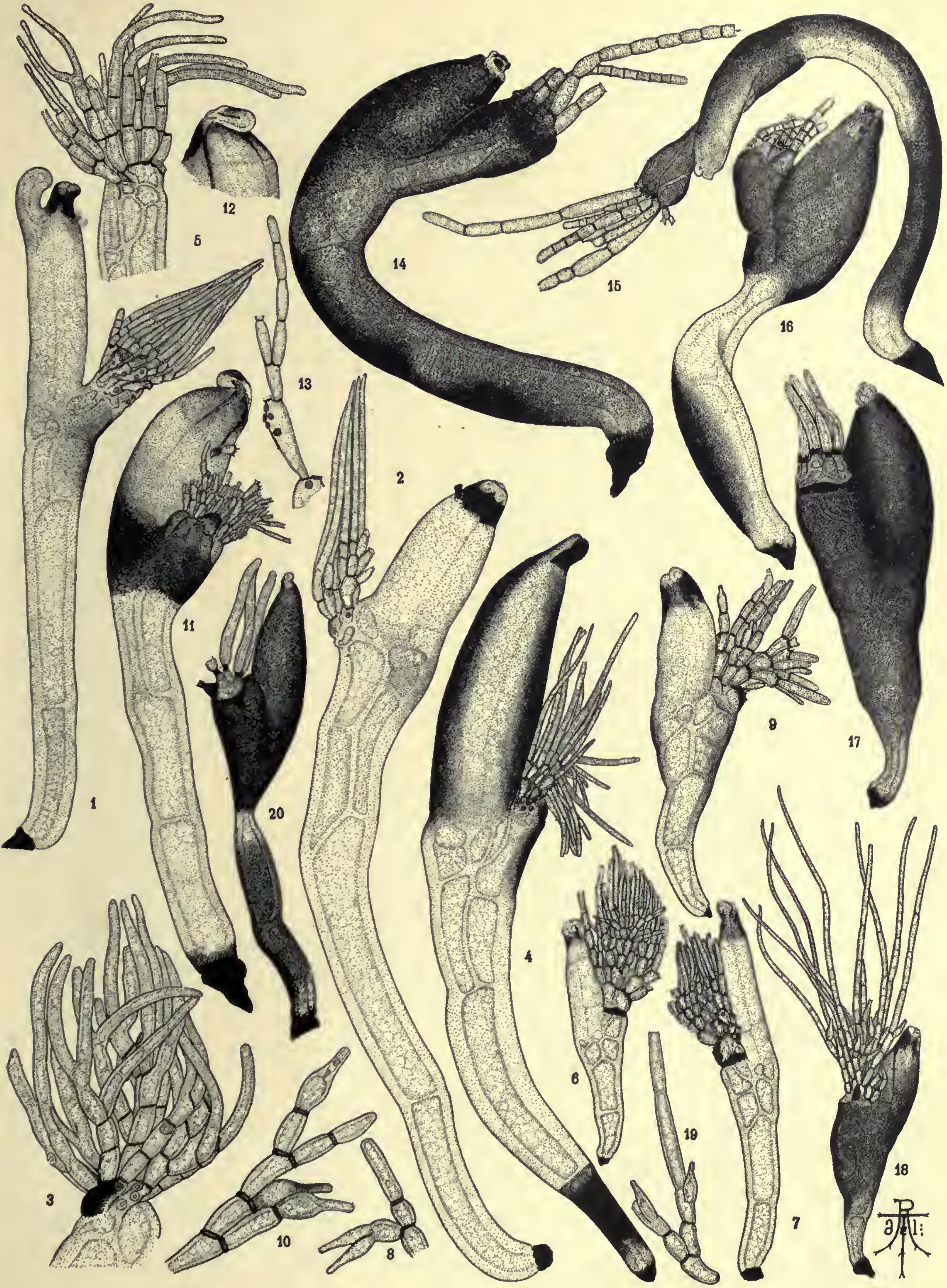


COCKAYNE, BOSTON.

THAXTER.—LABOULBENIACEAE

Laboulbenia	gibbifera	1	p. 411
"	Dercyli	2-3	p. 410
"	melanopus	4-5	p. 412
"	Acrogenus	6-8	p 362
"	Italica	9-10	p. 364
"	Cubensis	11-13	p. 414
"	anomala	14-15	p. 415
"	constricta	16	p. 414
"	coarctata	17	p. 420
"	aquatica	18-19	p. 413
"	strangulata	20	p. 419

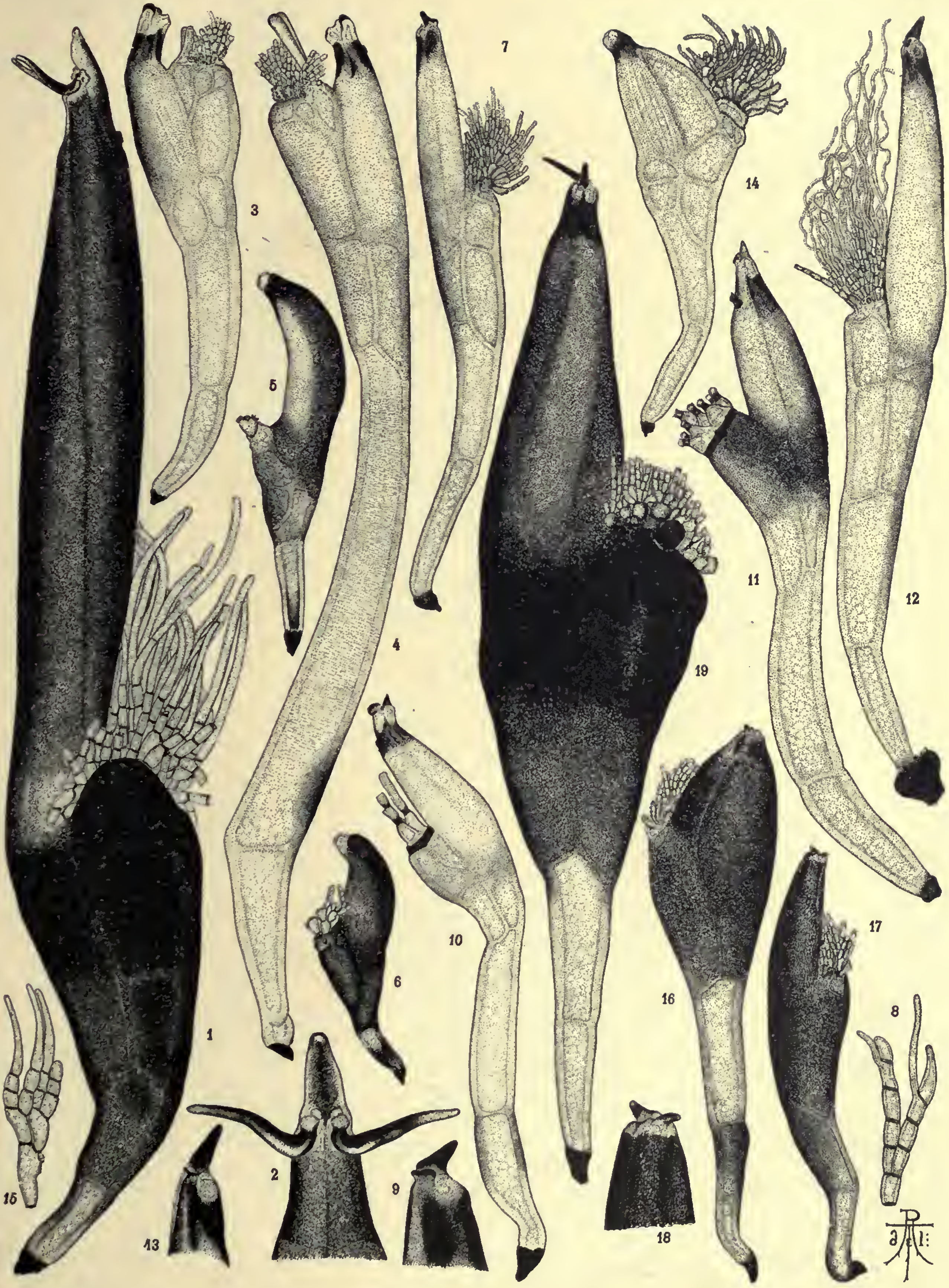
PLATE LXVI.



COCKAYNE, BOSTON.

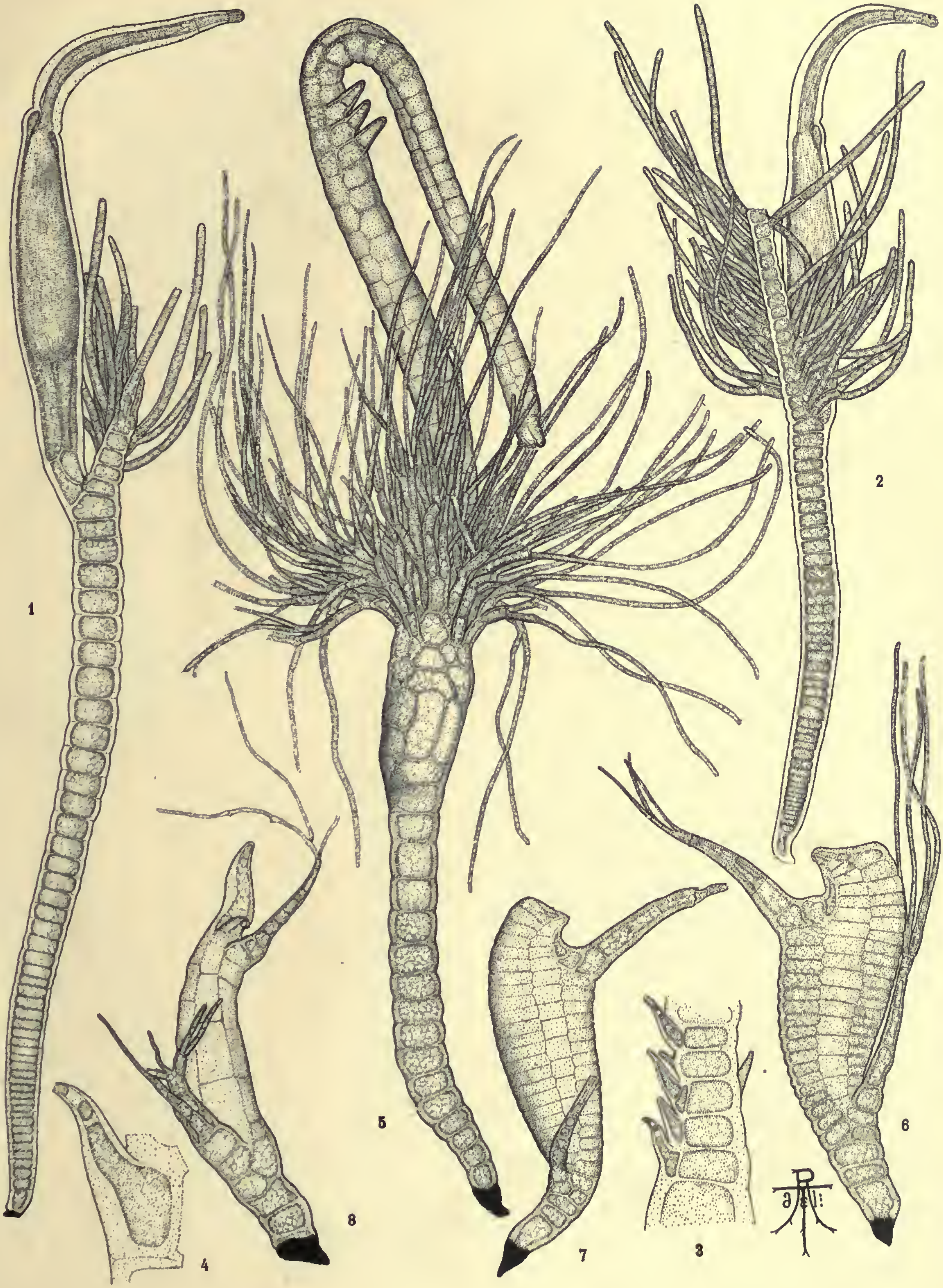
THAXTER,—LABOULBENIACEAE

Laboulbenia	bicornis	1-4	p. 413
"	dactylophora	3-4	p 415
"	drepanalis	5-6	p. 416
"	denticulata	7-9	p 417
"	Orectochili	10-11	p 419
"	denticulata	12-13	p 417
"	fallax	14-15	p 418
"	rotundata	16	p. 418
"	Dineutis	17-18	p. 417
"	Chaetophora	19	p. 412



COCKAYNE, BOSTON.

Hydrophilomyces rhyncophorus	1-4	p.431
Rhyncophoromyces elephantinus	5	p.433
Ceratomyces Californicus	6-7	p 438
Autoicomyces acuminatus	8	p 434



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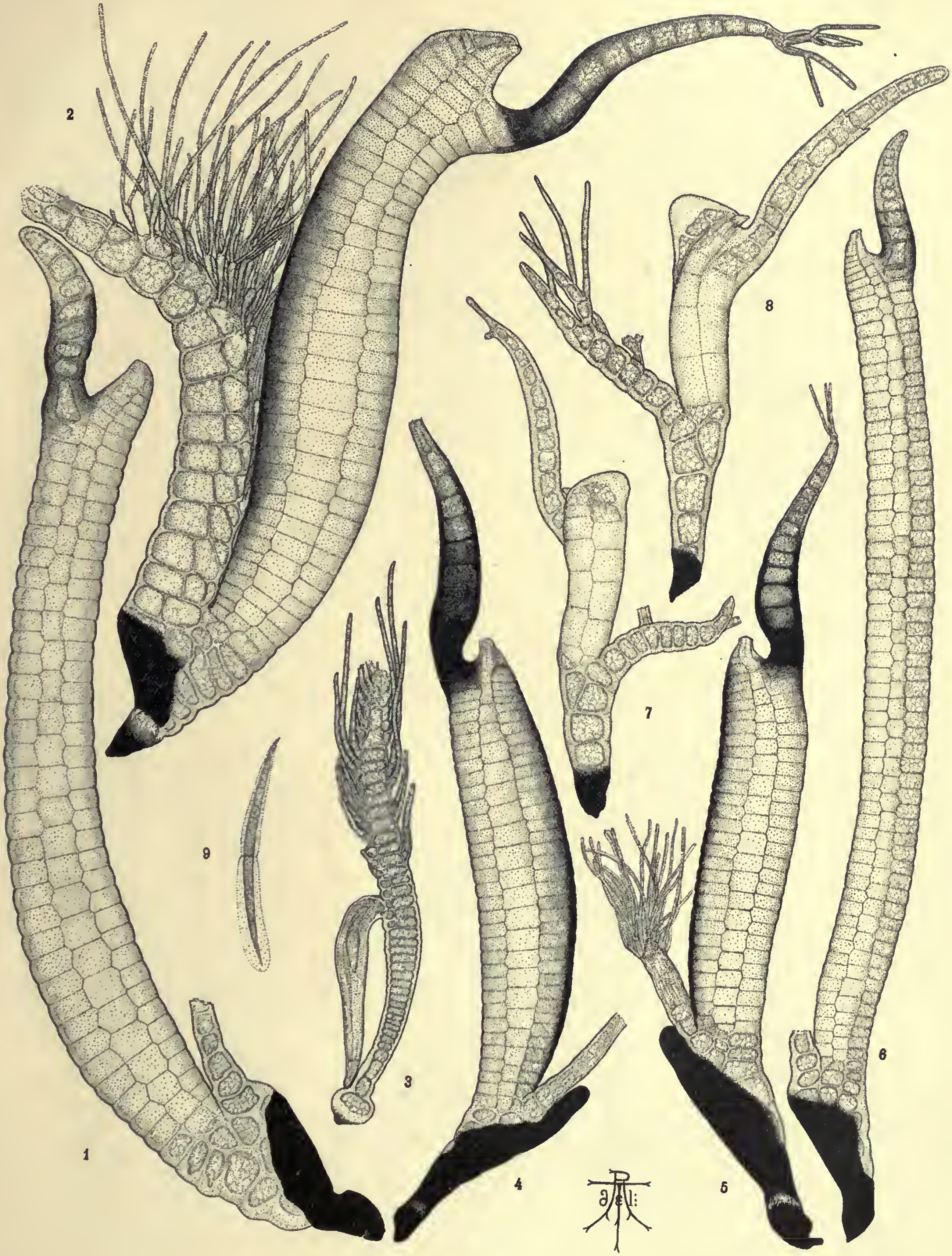
Ceratomyces curvatus	1	p 437
" cladophorus	2	p 437
Hydrophilomyces reflexus	3	p 432
Ceratomyces ansatus	4-5	p 439
" procerus	6	p. 436
Autoicomyces ornithocephalus	7-9	p. 435



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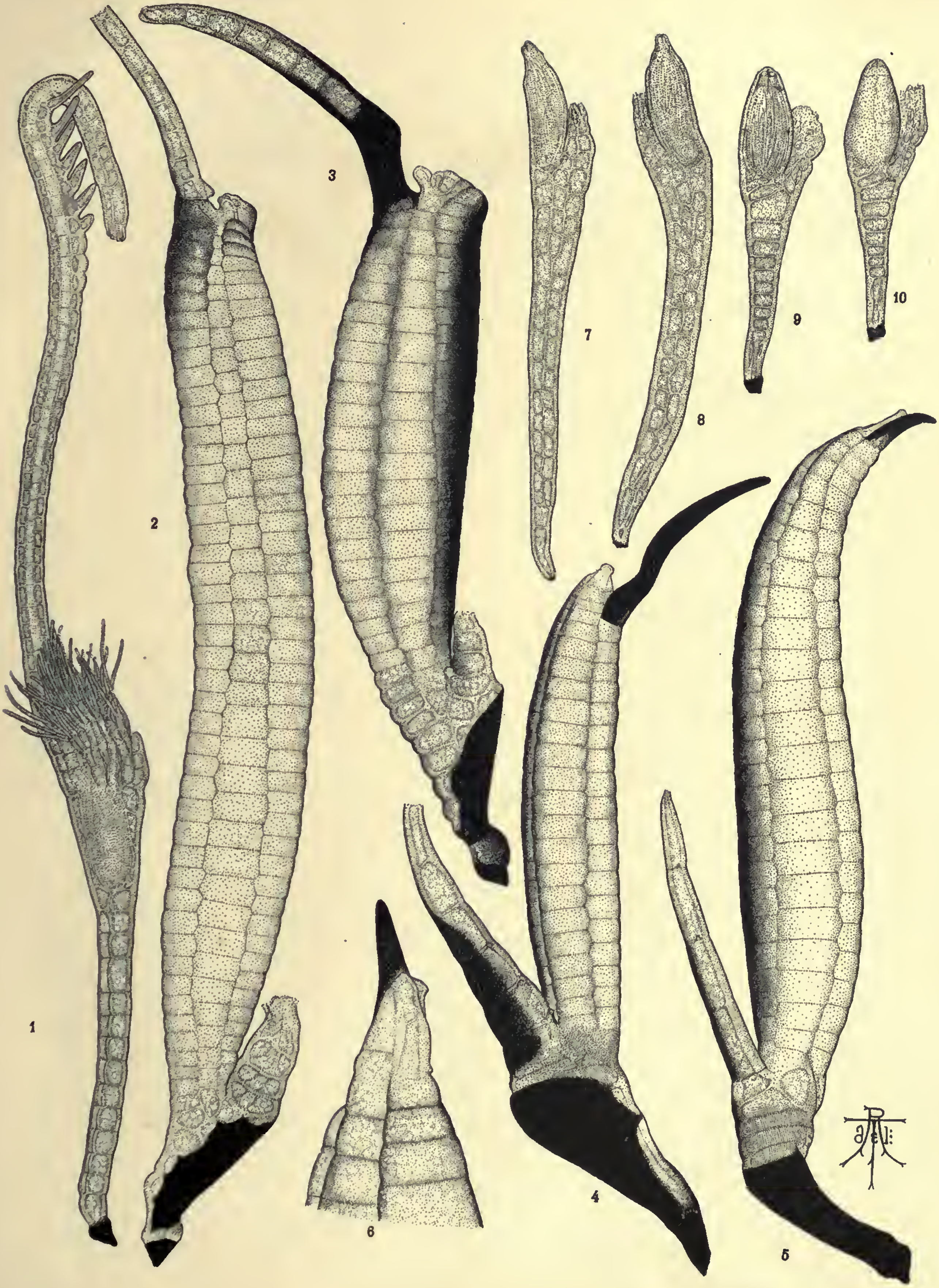
Rhyncophoromyces	denticulatus	1	p. 433
Ceratomyces	Braziliensis	2	p. 438
"	Mexicanus	3	p. 439
"	Floridanus	4	p. 440
"	spinigerus	5-6	p. 440
Misgomyces	Stomonaxi	7-8	p. 431
"	Dyschirii	9-10	p. 430

PLATE LXX.



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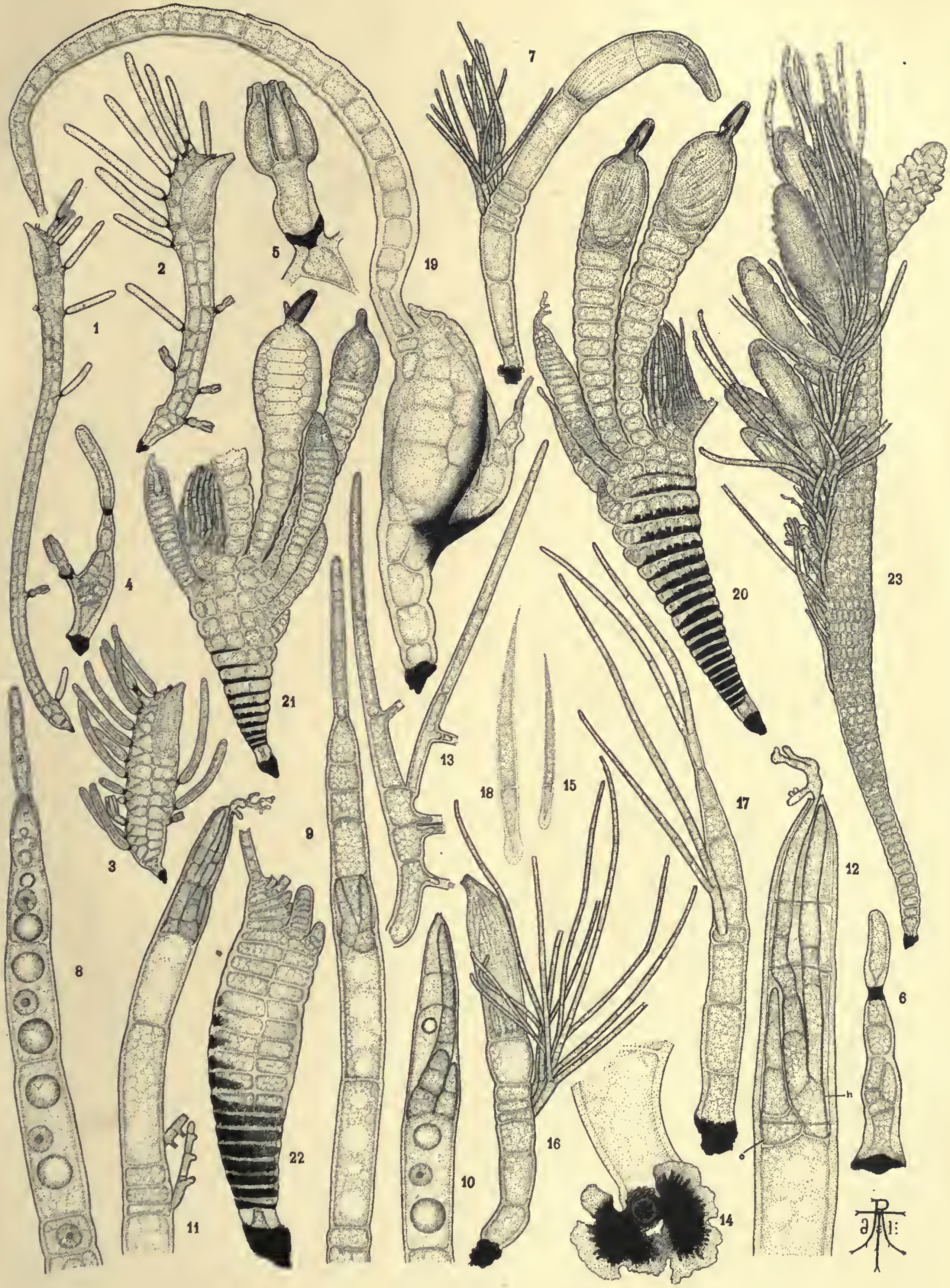
Distichomyces Leptochiri	1–6	p. 249
Coreomyces curvatus	7-15	p. 443
" Corisae	16-18	p. 443
Autoicomyces falciferus	19	p. 435
Kainomyces Isomali	20–22	p. 445
Euzodiomyces Lathrobii	23	p. 444

PLATE LXXI.



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